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VISCOUS AND VISCO-INTERTIAL GAS FLOW IN LIMESTONE CORES

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Viscous and Visco-Inertial Gas Flow in Limestone Cores", submitted by Robert A. Mackett, in partial fulfilment of the requirements for the degree of Master of Science in Petroleum Engineering.

ABSTRACT

In order to establish whether the turbulence factors and absolute permeabilities of limestone were consistent with similar values for other types of porous media, gas flow tests were conducted on three full-size limestone cores. The isothermal variation of the viscosity and the compressibility factor for nitrogen with pressure was evaluated in an integral form in order to investigate the magnitude of errors resulting from the assumption of average fluid properties in the derivation of the Darcy and Forchheimer equations for isothermal, steady-state, linear gas flow in porous media.

The absolute permeabilities and turbulences factors of the limestone cores were found to be consistent with similiar values for sandstone cores. The compatibility of the experimentally determined values of the absolute permeability and turbulence factor may be qualitatively checked using a plot of the friction factor-Reynolds number relationship derived from the Forchheimer equation. The turbulence factor could only be estimated to within a few orders of magnitude of the experimentally determined value using equations derived from the empirical correlation of the absolute permeability, turbulence factor and effective

porosity. The apparent gas permeabilities calculated using the average fluid properties did not differ appreciably from the values obtained using the viscosity and compressibility factor integrals.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (Continued)

INTRODUCTION

Fluid flow in porous media occurs in a highly complex network of flow channels. The internal void structure of unconsolidated porous media comprised of well-sorted granular particles is essentially determined by the geometrical properties and arrangement of the individual particles. In contrast, consolidated porous media are normally disordered pore structures because of the physical changes which occurred in the geological deposition and induration processes. Since the pore structure of consolidated porous media is not amenable to physical or mathematical description, it is characterized implicitly by empirical constants in dynamic flow equations.

By using the size, shape, dispersion and continuity of the pores as criteria, petroleum-producing rocks can be classified into two general porosity types. Homogeneous or uniform porosity-type rocks such as sandstone and intergranular limestone contain uniform, well interconnected flow channels. Heterogeneous or non-uniform porosity-type rocks such as most limestones and dolomites have a secondary porous structure augmenting the basic

intergranular pore network. The secondary porous structure may consist either of fractures or dead-end pores. While comprising only a small fraction of the total pore volume, fractures furnish a large degree of the permeability or flow capacity. Dead-end pore volume is defined as the pore volume which contains the flowing fluid, but through which there is no flux during steady-state flow[1]. In some heterogeneous rocks the dead-end pore volume may contribute up to sixty per cent of the effective porosity [2]. Effective porosity is defined as the percentage of the interconnected pore volume with respect to the bulk volume of the porous medium. Since two porous media with the same effective porosity may have considerably different permeabilities, effective porosity is not really indicative of a given pore structure or distribution. Nevertheless, effective porosity is commonly used to further delineate an empirical relationship between the absolute permeability and the turbulence factor[3 4 5].*

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* The words, visco-inertial, turbulent and turbulence, will be used in this thesis to describe fluid flow at high flow rates which does not obey the laminar flow equations.

The main objective of this investigation was to study the visco-inertial flow of gas through heterogeneous porous media consisting of full-size limestone cores. Although some limited research has been done on the visco-inertial flow of gas in small limestone and dolomite samples (4,6,7), most of the available data in the literature were on homogeneous porosity-type rocks, principally sandstones (4,5). In a recent investigation, Nichol (7) found that the turbulence factors for microvugular limestones were about an order of magnitude higher than values obtained from the turbulence factor-permeability correlation for any given permeability. A further objective of this present study was to determine whether the same trend holds for other types of limestone pore systems.

A second objective of this study was to investigate the magnitude of the errors resulting from the assumption of average fluid properties in the derivation of the Darcy and Forchheimer equations for isothermal, steady-state, linear gas flow in porous media. The isothermal variation, with pressure, of the viscosity and the compressibility factor for nitrogen was evaluated in an integral form and curve fitted by least-squares.

LITERATURE REVIEW

Visço-Inertial Flow Investigations

Scheidegger[8] reported that Forchheimer[9] had suggested that Darcy's law should be modified for high velocities by the addition of a second-order term in the velocity. The "Forchheimer equation", originally postulated by an analogy with phenomena occurring in tubes, is of the form

$$\frac{-\Delta p}{L} = F_a v + F_b v^2 \tag{1}$$

A third-order term is sometimes added to make the equation fit experimental data better.

$$\frac{-\Delta p}{L} = F_a v + F_b v^2 + F_c v^3 \tag{2}$$

Ergun[10] illustrated the validity of an expression similar to Equation (1) of the form

$$\frac{-\Delta p}{L} = F_a v + F_B \rho v^2 \tag{3}$$

Since a plot of $\frac{-\Delta p}{vL}$ versus ρv is linear for fluid flow

in unconsolidated porous media, Ergun suggested that the two-term expression between the pressure and flow rate was valid. By comparison of Equation (3) at low flow rates with Darcy's law, it is apparent that the factor F_a must be proportional to the viscosity.

Green and Duwez[11] employed a form of the quadratic flow equation similar to Equation (3) to define two parameters F_K (or α) and F_B (or β) which characterize the porous medium.

$$\frac{-g_c \Delta p}{L} = F_K \; \mu v + F_B \; \rho \; v^2 \tag{4}$$

where

$F_K = \dfrac{9.413 \times 10^{13}}{k}$ (ft^{-2}) is the viscous resistance coefficient, k(md) is the absolute permeability, and $F_B(\mathrm{ft}^{-1})$ is the kinetic resistance coefficient or the turbulence factor.

For gas flow:

$$\frac{-g_c \Delta (p^2)}{L} = 2 \; F_K \; \frac{\mu z R T}{M} \; \frac{w}{A} + 2 \; F_B \; \frac{z R T}{M} \; \frac{w^2}{A^2} \tag{5}$$

where

$\dfrac{w}{A} = \rho \; v \; (\frac{\mathrm{lbM}}{\mathrm{sec}})$ is the mass flow rate.

A friction factor-Reynolds number relationship may be used to correlate the gas-flow data over the entire range of flow. It is significant that the ratio of $\frac{F_B}{F_K}$ is used as the definition of the characteristic length term. In addition, the friction factor-Reynolds number correlation serves as a qualitative check on the accuracy of the experimental determination of the flow coefficients F_K and F_B.

$$f_G = \frac{2}{N_{ReG}} + 2 \tag{6}$$

where

$N_{ReG} = \frac{F_B}{F_K} \frac{w}{\mu A}$ is the Reynolds number, and

$f_G = \dfrac{\frac{-g_c \Delta p}{L}}{F_B \, \rho \, \frac{v^2}{2}} = \dfrac{\frac{-g_c \Delta (p^2)}{L}}{F_B \, \frac{zRT}{M} \, \frac{w^2}{A^2}}$ is the friction factor.

Cornell and Katz [6] developed a relationship similar to Equation (5), but they correlated the resistance coefficients derived from gas flow tests with parameters evaluated from electrical resistivity measurements

and some limited pore-size distribution tests.

$$F_K = \frac{32\ F_2}{k_1\ d_e}$$

$$F_B = \frac{32\ F^{3/2}}{k_2\ d_e\ \phi^{1/2}}$$

$$N_{ReC} = N_{ReG}$$

$$f_C = 32\ f_G$$

where

F is the formation resistivity factor,

k_1 = 0.5 is the Kozeny constant,

$d_e = \dfrac{(32F)^{1/2}}{(k_1 F_K)^{1/2}}$ is the effective pore diameter, and

k_2 is a geometrical factor which is presumably analogous to the roughness ratio used in pipe-flow analysis.

In practical engineering units (ft-lb_F-lb_M-sec):

$$f_C = \frac{-32\ g_c\ \Delta(p^2)}{F_B\ \dfrac{zRTL}{M}\ \dfrac{w^2}{A^2}} \tag{7}$$

and

$$N_{ReC} = \frac{F_B \; \frac{W}{A} \; k}{6.33 \times 10^{14} \; \mu} \quad \text{with } \mu (10^{-4} \text{ cp}) \tag{8}$$

Ergun and Orning[12] developed the following empirical relationship to describe gas flowing through randomly packed beds of glass, lead, and celite sphere, celite cylinders, Raschig rings and Berl saddles.

$$-\frac{\Delta p}{L} = 2 \, F_\alpha \, \frac{(1-\phi)^2}{\phi^3} \, A_{fs}^2 \, \mu \, v + \frac{F_\beta}{8} \, \frac{(1-\phi)}{\phi^3} \, A_{fs} \, \rho v^2 \tag{9}$$

where F_α and F_β are empirical correction factors, and A_{fs} (sq cm) is the specific surface.

Therefore,

$$k = \frac{5.066 \times 10^{10}}{F_\alpha \; A_{fs}^2} \; \frac{\phi^3}{(1-\phi)^2}, \text{ and} \tag{10}$$

$$F_B = 3.810 \; F_\beta \; A_{fs} \; \frac{(1-\phi)}{\phi^3} \tag{11}$$

Iffley[13] described gas flowing in both consolidated and unconsolidated porous media using parameters based on a converging-diverging truncated cone type of flow channel.

$$-\frac{\Delta (p^2)}{L} = \frac{\mu}{k} \; \frac{2R}{M} \; \frac{wT}{A} + \frac{m^2 \; c}{8 \; k \; \phi} \; \frac{R}{MT} \; \frac{(wT)^2}{A^2} \tag{12}$$

m is the radius of the diverging tc converging pore cross-sections, and

c (mu) is the radius of the converging pore cross-section.

It can be shown that

$$F_B = 1.930 \times 10^7 \frac{m^2 \; c}{k \quad \phi} \tag{13}$$

An equation, applicable to laminar and turbulent flow of water in unconsolidated beds of glass beads, sand, gravel, anthracite coal, granulated activated charcoal and ion-exchange resin, was developed and experimentally verified by Ward[14].

$$\frac{-\Delta p}{L} = \frac{\mu}{k} v + \frac{F_C}{k^{\frac{1}{2}}} \rho v^2 \tag{14}$$

where

F_C = 0.550 ± 0.024 is a dimensionless constant,

and

$$F_B = 9.702 \times 10^6 \frac{F_C}{k^{\frac{1}{2}}} \tag{15}$$

Ward stated that the dimensionless constant had the same value for liquid flow in all unconsolidated porous media. However, substitution of 114 published values of F_B and k into Equation (15) shows that F_C varies over the range

from 1.38 x 10^{-1} to 8.07 x 10^{7} for gas flow in consolidated and unconsolidated porous media. Therefore, while F_C is not a constant for gas flow in all porous media, it may be used as a characterizing parameter for a given porous medium.

Tek, Coats, and Katz[15] accredit Cornell and Katz[16] with the original attempt to correlate the turbulence factor with the permeability. Subsequently, Janicek and Katz[3] used the effective porosity as an additional correlating parameter to get the following relationship.

$$F_B = \frac{5.5 \times 10^{9}}{k^{5/4} \quad \phi^{3/4}} \tag{16}$$

Greenberg and Weger[17] carried out an experimental investigation of the constancy of the viscous and kinetic resistance coefficients, F_K and F_B, of porous sintered metals for varying conditions of pressure and temperature. They found that F_K and F_B were independent of pressure up to 2,000 psi; F_B was essentially independent of the temperature but the permeability decreased with increasing temperature. Hamilton[4] confirmed the observation that the permeability of the rock decreased when the temperature of the medium and of the flowing gas was increased.

Hamilton proposed the following relationship between the permeability, porosity and turbulence factor on the basis that the equation fit the data available at that time.

$$F_B = \frac{6.6 \times 10^7}{k^{1.13} \quad \phi^{2.76}} \tag{17}$$

Another possible relationship was suggested by Sadiq[5].

$$F_B = \frac{1.167 \times 10^5}{k^{0.5} \ \phi^{5.07}} \tag{18}$$

Sadiq also investigated the significance of the formation resistivity factor, F, as a correlating parameter. He stated that a plot of F_B versus $\phi^5.(k\ F)^{0.5}$ appeared to fit the experimental data best.

Nichol[7] found that the presence of a static second phase altered the normal relationship between the turbulence factor and permeability. While the permeability decreases as the saturation of the static second phase increases, the turbulence factor first decreases, then increases rapidly. Thus, it is advisable to make sure that cores are dried thoroughly before conducting visco-inertial flow experiments.

Turbulence factors for microvugular carbonate systems were found to be an order of magnitude higher than most of the published values[7]. Inspection of the experimental apparatus reveals that this discrepancy may have resulted from incorrect pressure-drop readings. The pressure was measured in the flow line upstream of the core holder, not at the core face as recommended by Hamilton[4]. Therefore, a further study of limestone rock systems is deemed advisable in view of this discrepancy.

Viscous or Slip-Flow Investigations

Klinkenberg [18] acknowledged that the investigations of Kundt and Warburg[19] indicated that it is necessary to account for the motion of the gas layer immediately adjacent to the wall of a capillary tube. The motion of this layer in the direction of gas flow, commonly termed gas slip, usually occurs when the mean free path of the gas molecules approaches the dimensions of the flow conduit. Gas slip in tubes results in a larger quantity of gas flowing than the amount predicted by the Poiseuille equation. Under such mean free path conditions the gas layer immediately adjacent to the wall of the capillary has a finite velocity in the direction of the flow. The

velocity of the gas layer is theoretically equivalent to the summation of the velocity components of the individual molecules contained in the gas layer.

In the simple kinetic theory of gases (20) gas molecules are considered to be rigid, impenetrable, spherical particles which exhibit perfectly elastic behavior during collisions. The mean free path is defined as the average distance travelled by a gas molecule between intermolecular collisions. The mean free path, F_{Mp}, is given by the following relationship.

$$F_{Mp} = \frac{0.22508}{n_M \, d_{Mc}} = \frac{zRT}{pN} \frac{0.22508}{d_{Mc}} \qquad (19)$$

where

N is Avagadro's number

d_{Mc} is the collision diameter

$n_M = \frac{N}{V}$ is the number of molecules per unit volume

V is the molal volume.

Consequently, for perfect gases, the mean free path of a gas molecule is inversely proportional to the pressure at a constant temperature, but it is independent of the temperature at a constant gas density. An expression for the mean free path of a gas molecule can also be derived in terms of the gas viscosity.

$$F_{Mp} = 12.7 \times 10^{-6} \, \frac{\mu}{p} \, \frac{(RT)^{\frac{1}{2}}}{M^{\frac{1}{2}}} \tag{20}$$

where

F_{Mp} (cm) is the mean free path,

μ (cp) is the gas viscosity,

p (atm) is the absolute pressure,

T (K) is the absolute temperature, and

$R = 82.06 \left(\frac{\text{atm cc}}{\text{gm mole K}}\right)$ is the gas constant.

In the rigorous approach for real gases, however, Hirschfelder, Curtiss and Bird[20] state that the mean free path does not appear naturally in the derivation of the coefficient of viscosity.

Early investigations of the viscous flow in porous media indicated that the permeability to water was generally lower than the permeability to air. Usually this difference was small for highly permeable media, but it was significant for media of low permeability. In order to explain these discrepancies, Klinkenberg[18] developed an analogy to the flow of gas in capillary tubes. An expression was formulated for a capillary model of a porous medium consisting of parallel uniform capillaries of equal radius, r_p, in which there is slippage of the gas molecules in the gas layer next to the wall.

$$k_a = k\left(1 + \frac{4F_{kc}\,F_{Mp}}{r_p}\right) \tag{21}$$

where

k_a is the apparent gas permeability of the medium,

k is the equivalent liquid permeability or the gas permeability at infinite mean pressure, and

$F_{kc} \approx 1.0$ is a constant for a particular gas.

By assuming that the mean free path of the gas molecules varied inversely as the mean pressure, Klinkenberg postulated that the following relationship is applicable to gas flow in porous media.

$$k_a = k\left(1 + \frac{F_{kb}}{\bar{p}}\right) \tag{22}$$

where

$F_{kb} = \frac{4\,F_{kc}\,F_{Mp}}{r_p}\,\bar{p}$ is the Klinkenberg constant or "b-factor" for a given gas and rock.

A plot of k_a versus $\frac{1}{\bar{p}}$ is commonly called the "Klinkenberg plot". The Klinkenberg plot is linear in the low flow rate regions, but it is curved downward in

the high mean pressure regime where visco-inertial effects prevail. Klinkenberg verified that the apparent gas permeability does not depend on the imposed pressure differential as long as the mean pressure is maintained at a constant value. The data also supported the validity of the theoretical definition of the b-factor in terms of the capillary radius, since it was shown that the b-factor generally decreased as the absolute permeability increased. It was established that the apparent permeabilities to different gases increase as the mean free paths of the different gas molecules increase; and that the apparent gas permeabilities of a porous medium to different gases extrapolate to the same value of the apparent gas permeability at an infinite mean pressure. Klinkenberg concluded that the apparent gas permeability extrapolated to an infinite mean pressure is equivalent to the liquid permeability of a porous medium to within the limits of experimental error.

The data of Calhoun and Yuster[21] at a given temperature illustrates that equivalent values of the apparent gas permeability of a given medium to different gases exist at certain mean pressures where the mean free paths of the different gas molecules are equivalent.

Equation (19) shows that the mean pressure must be increased proportionately in order to maintain equivalent mean free path conditions when the temperature is increased. Thus, as a first approximation, Calhoun and Yuster predicted that the same value of the apparent gas permeability to a given gas should occur at mean pressure $\bar{p}_1$ and temperature T_1 as at mean pressure $\bar{p}_1 \frac{T_2}{T_1}$ and temperature T_2.

Rose [22] proposed the following expression to determine equivalent apparent gas permeabilities of a medium to different ideal gases at different temperatures.

$$k_a(\text{gas 1 at } \bar{p}_1, T_1) = k_a(\text{gas 2 at } \bar{p}_2, T_2) \qquad (23)$$

where

$$\bar{p}_2 = \frac{\mu_2}{\mu_1} \frac{(T_2 \; M_1)^{\frac{1}{2}}}{(T_1 \; M_2)^{\frac{1}{2}}} \cdot \bar{p}_1$$

Stewart and Owens [23] demonstrated the reduction of permeability due to turbulence at constant gas slippage conditions. The apparent gas permeability was plotted against the pseudo-Reynolds number, N_{pRe}, which is defined as:

$$N_{pRe} = \frac{w}{\mu A} \tag{24}$$

The apparent gas permeability decreased with increasing pseudo-Reynolds numbers, that is, at high rates. The authors did not present a theoretical justification for such a decrease in the apparent gas permeability. However, by assuming that visco-inertial flow conditions prevail, the reason can easily be seen by rearranging Equation (5).

$$k_a = \frac{k}{1 + \frac{F_B \; k}{9.413 \times 10^{13}} \quad \frac{w}{\mu A}} \tag{25}$$

A decrease in the apparent gas permeability with increasing mean pressures was demonstrated for constant values of the pseudo-Reynolds numbers in the viscous flow regime. This can also be illustrated mathematically as follows:

$$k_a = 9.413 \times 10^{13} \; \frac{zRT}{M \; g_c} \; \frac{\mu^2}{\bar{p}} \; \frac{L}{-\Delta p} \; \frac{w}{\mu A} \tag{26}$$

Dranchuk and Sadiq[24] noted that care should be exercised in the analysis of Klinkenberg permeability data. Even though the apparent gas permeability and the

reciprocal mean pressure may appear to be a linear graphical relationship, additional evidence is required to establish that viscous flow conditions prevail. Otherwise, pseudo-linear data in the visco-inertial regime will yield an erroneous value for the absolute permeability.

THEORY

Integral Forms of the Flow Equations

Owing to the high mean pressures sometimes required to determine Klinkenberg permeabilities in the visco-inertial flow regime, a study was undertaken to examine the magnitude of the errors arising from the use of average fluid properties in the flow equations.

Equation (26), an integrated form of Darcy's law derived by assuming average fluid properties at the mean flowing gas pressure and temperature, can be expressed in terms of practical laboratory units.

$$\text{"PERM" or } k_a = 0.25666 \frac{L}{A} \; zT \mu \frac{q_{sc}}{-\Delta(p^2)} \qquad (27)^{**}$$

where

k_a (md) is the apparent gas permeability,

"QSC" or q_{sc} (scfh) is the volumetric flow rate at 14.65 psia and 60 F,

"DIFPS" or $-\Delta(p^2)$ (psia^2) is the pressure-squared gradient across the core,

μ (cp x 10^{-4}) is the viscosity of nitrogen at $\bar{p}$,$\bar{T}$,

z is the compressibility factor at $\bar{p}$, $\bar{T}$, and

$\frac{L}{A}$ (in^{-1}) is the length to cross-sectional area ratio of the core.

** Mnemonic variables used in the computer program are denoted by capitalized letters enclosed in apostrophies.

Darcy's law can also be integrated by assuming an average value of the viscosity at the mean flowing conditions; but the variation of the compressibility factor can be expressed as a function of the pressure at the mean flowing gas temperature.

$$\text{"PERMZ" or } k_a = 1.2015 \times 10^{-4} \; \frac{L}{A} \; \frac{\mu \, \overline{T}_r \, q_{sc}}{\text{"ZNUM"}} \qquad (28)$$

where

$$\text{"ZNUM"} = \int_0^{p_{r1}} \frac{p_r}{z} \, dp_r \; - \; \int_0^{p_{r2}} \frac{p_r}{z} \, dp_r \qquad (29)$$

$$p_r = \frac{p}{492.3} \quad \text{is the reduced pressure of nitrogen,}$$

$$\overline{T}_r = \frac{\overline{T}}{226.7} \quad \text{is the average reduced temperature.}$$

The variation of the compressibility factor and the viscosity with pressure at the average flowing temperature can also be taken into account in the integration of Darcy's law.

$$\text{"PERMI" or } k_a = 0.021926 \; \frac{L}{A} \; \frac{\overline{T}_r \, q_{sc}}{\text{"DENKI"}} \qquad (30)$$

where

$$\text{"DENKI"} = \int_0^{p_{r1}} \frac{p_r}{z \, \mu_r} \, dp_r \; - \; \int_0^{p_{r2}} \frac{p_r}{z \, \mu_r} \, dp_r \qquad (31)$$

$\mu_r = \frac{\mu}{182.5}$ is the reduced viscosity of nitrogen

Equation (5), an integrated form of the Forchheimer equation derived by assuming average fluid properties at the mean flowing conditions of pressure and temperature, can be written in terms of the same practical laboratory units used in Equation (27).

$$\text{"FPS"} = F_K + F_B \text{ "FQ"} \tag{32}$$

where

$$\text{"FQ"} = 4.3820 \times 10^4 \frac{q_{sc}}{A \mu}$$

"VX" $= \mu(\text{cp} \times 10^{-4})$ is the viscosity of nitrogen and $\bar{p}$ and $\bar{T}$, and

$$\text{"FPS"} = 1.6072 \times 10^{19} \frac{-\Delta(p^2)}{zT \mu^2 L} \frac{1}{\text{"FQ"}}$$

If the variation of the compressibility factor is expressed as a function of pressure at the constant mean flowing gas temperature, the resultant equation is of the form

$$\text{"FZPS"} = F_K + F_B \text{ "FQ"} \tag{33}$$

where

$$"FZPS" = 7.8351 \times 10^{17} \frac{A}{L} \frac{"ZNUM"}{\bar{T}_r \; q_{sc} \; \mu}$$

The differential form of Equation (32) cannot be integrated exactly to account for the variation of the viscosity with pressure at a constant flowing temperature due to the viscosity term in the denominator of the "FQ" mnemonic variable. However, a partial account of the variation of viscosity with pressure at a constant flowing temperature may be formulated if some average value is assumed for the viscosity in "FQ", that is either

$$"FIPS" = F_K + F_B \; "FQ" \tag{34}$$

where

$$"FIPS" = 4.2932 \times 10^{15} \frac{A}{L} \frac{"DENKI"}{\bar{T}_r \; q_{sc}}$$

or

$$"FIPS" = F_K + F_B \; "FIQ" \tag{35}$$

where

$$"FIQ" = 4.3820 \times 10^{4} \frac{q_{sc}}{A} \frac{1}{"VIAV"}$$

$$"VIAV" = 182.5 \frac{"ZNUM"}{"DENKI"} \quad (cp \times 10^{-4}) \text{ is some} \tag{36}$$

integrated-average type of viscosity.

Vol-O-Flo Meter Theory

Steel and Orbach[25] reported that the general flow equation, for any practical conduit in which flow is laminar, contains a large Poiseuille pressure-drop term plus a small term arising from back-pressure produced by flow through restrictions such as orifices.

$$-\Delta P = F_{bV} \, \mu \, q + F_{aV} \, \rho q^2 \tag{37}$$

where

F_{aV} and F_{bV} are constants dependent upon the geometry of the conduit and the units used.

After several unsuccessful attempts to curve fit the Δp versus q data using least-squares, it was decided to use the same approach employed in the solution of Equation (5), namely, to evaluate the constants F_{aV} and F_{bV}. Equation (37) can be rearranged and expressed in terms of practical laboratory units for the flow of nitrogen through the meter.

$$F_{AV} \, q_{sc}^2 + F_{BV} \, q_{sc} + F_{CV} = 0 \tag{38}$$

where

$$F_{AV} = 4.024 \times 10^{-10} \, F_{aV}$$

$$F_{BV} = 1.348 \times 10^{-12} F_{bV} \mu$$

$$F_{CV} = +437.0 \frac{\bar{p}}{zT} \Delta p$$

$-\Delta p$ (in water) is the differential pressure across the orifice element, and

$\bar{p}$ (psia) is the mean pressure midway in the orifice element.

Equation (38) can be changed into the following equation,

$$3.242 \times 10^{14} \frac{\bar{p}}{zT\mu} \frac{-\Delta p}{q_{sc}} = F_{bV} + F_{aV}\, 298.5 \frac{q_{sc}}{\mu} \quad (39)$$

The plot of the left-hand side of Equation (39) versus $298.5 \frac{q_{sc}}{\mu}$ yields F_{bV} as the intercept and F_{aV} as the slope.

A friction factor-Reynolds number relationship for the Vol-O-Flo meter was also developed by rearranging Equation (29).

$$f_V = \frac{64}{N_{ReV}} + 64 \quad (40)$$

where

$$f_V = \frac{6.952 \times 10^{13}}{F_{aV}} \frac{\bar{p}}{zT} \frac{-\Delta p}{q_{sc}^2} \quad (41)$$

is the friction factor, and

$$N_{ReV} = \frac{F_{aV}}{F_{bV}} \; 298.5 \; \frac{q_{sc}}{\mu} \text{ is the Reynolds number.} \quad (42)$$

The standard volumetric flow rate can be found by the solution of the quadratic Equation (38)

$$q_{sc} = \frac{-F_{BV} + (F_{BV}^2 + 4\, F_{AV}\, F_{CV})^{\frac{1}{2}}}{2\, F_{AV}} \quad (43)$$

EXPERIMENTAL APPARATUS

The experimental determination of the absolute permeability and turbulence factor necessitated measurements of the pressure, temperature and flow rate in both the viscous and visco-inertial flow regimes. Consequently, a wide variety of pressure and flow rate measuring devices was required, in conjunction with other auxiliary equipment.

Constant control of the upstream core pressure was attained by the use of a manifold of continuously-bleeding Moore "Nullmatic" pressure regulators attached to a series of interconnected cylinders of commercially pure nitrogen. In order to overcome the cooling effect due to the throttling action of the regulators, nitrogen was passed through a copper coil immersed in a constant temperature glycol bath. Then, as illustrated in Figure 1, nitrogen was passed through a flow-line thermocouple and injected into the core through a flow-line tap in the end-face of the core holder.

Pressures greater than 30 psig were measured with calibrated bourdon-tube Heise pressure gauges. Mercury

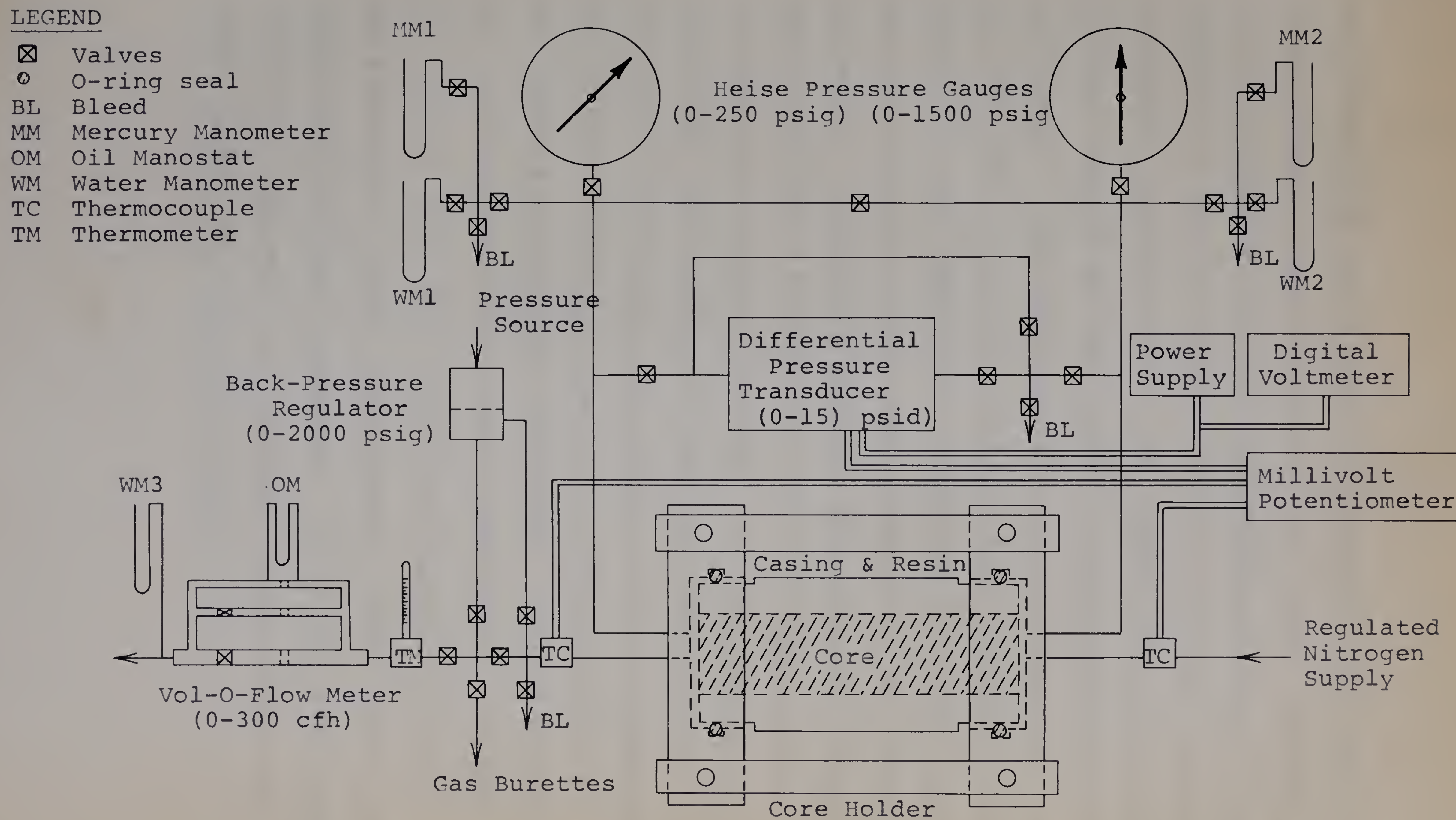

FIGURE 1 DIAGRAM OF EXPERIMENTAL APPARATUS

manometers were used to measure pressures from 2 to 30 psig. Water manometers were used from 0 to 2 psig. To avoid the risk of saturating the core with manometer fluids, a calibrated 0 to 15 psid Stratham PM 80 TC differential pressure transducer was connected to the upstream and downstream pressure taps of the core holder to measure differential pressures at high mean pressures. The differential pressure transducer required a constant input voltage of sixteen volts which was supplied by a Kempo SC-18-1 power supply and monitored by a Non-Linear Systems Model 481 digital voltmeter. A Leeds and Northrup 8686 millivolt potentiometer was used to measure the output voltages of the differential pressure transducer, and the upstream and downstream iron-constantan flow-line thermocouples. A flow-line thermocouple was initially used to measure the temperature of the gas entering the meter run, but it was replaced with mercury thermometer, thereby decreasing the time required to record potentiometer readings.

A 0 to 2,000 psig Grove back-pressure regulator was employed to provide back-pressure control at high flow rates and high static pressures. At low flow rates back-pressure on the core was maintained by adjusting a set of needle valves, as described by Sadiq [5].

Measurements of high gas flow rates were made with a triple-element "Vol-O-Flo" Model 20ER meter supplied by the National Instrument Company. The smallest element covered the flow range from 0.3 to 3 cfh; the medium-sized element from 3 to 30 cfh; and the largest element from 30 to 300 cfh. A calibrated differential oil manostat connected across the slotted flow elements provided readings which were converted into values of standard flow rate. Water manometer Number 3 was used to detect any back-pressure resulting from other flow devices being operated in series with the Vol-O-Flo meter during calibration runs. Low flow rate, from 0.002 to 0.1 scfh, were measured using either a water-displacement burette, an oil-displacement burette or a soap-film-displacement burette. The soap-film-displacement burette required the least experimental manipulation. Since a series of soap films could be displaced concurrently in the burette, flow-rate readings could be checked by timing the displacement of several soap films.

The massive core holder, shown in Figure 2, was designed to withstand extremely high pressures. A three-quarter inch recess was cut into the two inch thick end-plates to provide a seat for a machined insert. The

machined insert, in turn, had a one-half inch recess, slightly larger than 6-1/2 inches inside diameter. The machined insert was designed to provide a seat and a circumferential O-ring pressure seal for the 6-1/2 inch outside diameter machined ends of the large mounted cores. The inside axial surface of the machined insert was grooved radially to insure that a uniform pressure was imposed over the entire end-face of the core. Since the investigation by Hamilton[4] recommended that the pressure taps should be located at the end-face of the core, the pressure and flow-line taps were drilled into the machined insert.

Large limestone cores were mounted in 6-5/8 inch outside diameter oil well casing using an epoxy resin. The method employed will be discussed in the section entitled "Core Mounting and Cleaning Procedure".

Following insertion of the core into the end-plates, slotted steel bars were attached to the end-plates by means of tranverse steel pinions. The end-plates were forced to seal on the machined ends of the mounted core by two 5-inch swivel-mounted mechanical screws pinioned to the upper and lower slotted rails. One-eighth inch stainless steel Autoclave lines were then connected to the pressure and flow-line taps.

EXPERIMENTAL PROCEDURE

Core Mounting and Cleaning Procedure

Eighteen full-size limestone cores, 3-1/2 inches in diameter and from 4-1/2 to 14 inches long, were mounted in oil well casing using an epoxy resin to fill the annular space. The cores were initially coated with a thin layer of the epoxy resin in order to prevent any intrusion of the resin into the internal porous structure of the core.

During the pouring process, the cores were held in place by two plywood centering boards having circular holes cut to fit the outside dimensions of the core and casing. The core was sealed to the lower mounting board by winding masking tape around the lower excess portion of the core. Vaseline petroleum jelly was found to be an adequate mold-release compound.

A low viscosity epoxy resin was formed by mixing 100 gm of Hysol 4160 resin and 80 gm of Hysol 3688 hardener. Only small quantities of the mixture were prepared at one time to avoid the bonding and shrinkage problems encountered by Hamilton [4] using another type of resin.

The mixed resin was allowed to cure for a period of from 4 to 5 hours, then a froth, formed by nitrogen bubbles on the top of the resin in the annulus, was removed. A trial and error investigation showed that the froth formation problem could be minimized by thoroughly stirring the 4160 resin before mixing. Either the resin was not too stable in suspension or some degenerative reaction occurs with the air since a dark-colored viscous mass was formed in the bottom of the 4160 resin containers. The overall mounting process proved to be very time consuming because the curing reaction was highly exothermic and required a day to cure at room temperature. Approximately an one-half inch of the annular space could be filled daily. However, the bonding of the resin to the core and casing proved to be excellent and the annular material was found to withstand varying pressure loads.

After the annular space was filled with resin, the end-faces of the mounted core were machined flat. The casing was then machined down to 6-1/2 inches outside diameter at both ends to provide a smooth seat for the circumferential O-ring pressure seals in the core holder.

The mounted cores were alternately flushed with

liquid propane and dried with nitrogen gas to remove any rock residue left by the machining operation. The cleaned cores were stored in a dry room until the commencement of further experimental flow tests.

Effective Porosity Determination

The bulk volume of the limestone cores was determined from numerous caliper measurements of the diameter of the unmounted core and of the length of the finished core. The dimensions of the machined casing were also calipered to determine the gross bulk volume of the mounted core. A large calibrated gas-expansion porosimeter was used to measure the gross grain volume of the mounted core.

The effective porosity of the core was calculated using the following relationships.

$$\text{Pore volume of core} = \text{Gross bulk volume of mounted core} - \text{Gross grain volume of mounted core}$$

$$\text{Effective porosity, } \phi = \frac{\text{Pore volume of core}}{\text{Bulk volume of core}}$$

Flow Measurements

The machined ends of the mounted cores were coated

with "Lubriseal" high-vacuum grease prior to the insertion of the core into the core holder. Following the connection of the pressure and flow lines to the end-plates, the core holder was pressure-tested for leaks. A soap solution was applied to all Autoclave connections to detect the formation of the minute gas bubbles indicating leaks. As insurance against subsequent small leaks, Wendar's "Ev-A-Grip" adhesive was applied to all connections.

To initiate an experimental flow test, the pressure regulators were adjusted to provide a flow rate in the desired range. By periodically observing the upstream and downstream core-face pressures, it was possible to tell when stabilized flow conditions were attained. A very gradual change in the pressure readings at very low flow rates was attributed to the mechanical action of the pressure regulators. The flowing gas temperature at low flow rates was also difficult to control with the constant temperature bath. Low flow rate tests were always run before the high flow rate tests in order to avoid waiting for the core temperature to stabilize. Gas Expansion effects established temperature gradients of up to six degrees Fahrenheit across the core at high flow rates. As the room temperature increased, a gradual in-

crease in the flowing gas temperature was also noted. By using a thermostatically controlled temperature cabinet to inclose the core holder and the nitrogen cylinders, the temperature increase with time could probably be eliminated.

A typical experimental run included the following observations: (1) barometric pressure, (2) room temperature, (3) upstream thermocouple reading, (4) downstream thermocouple reading, (5) gas temperature in the meter run, (6) upstream core-face pressure, (7) downstream core-face pressure, and (8) flow-rate reading.

The experimental data was recorded in a systematic manner in order to facilitate the punching of data on computer input cards. Less than a minute was required to punch all the data for an experimental run in the first 67 columns of a Hollerith punch card using an IBM 26 key punch under program-card control.

The general aspects of the computer program will be discussed in the section entitled "Treatment of Data". A sample of the computer program and an explanation of the mnemonic input and output variables will be presented in Appendix II.

TREATMENT OF DATA

General Aspects of the Computer Program

A computer program, in Fortran IV compiling language, was written to process the experimental data. A simplified flow diagram of the computational process is illustrated in Figure 2.

The various pressure and flow-rate measuring devices were identified by the mnemonic and integer labels shown in Table 1 so that the appropriate conversion and calibration factors were applied to experimental observations.

Table 1

IDENTIFICATION OF FLOW-RATE AND PRESSURE MEASURING DEVICES

Mnemonic Label	Integer Label	Flow-Rate or Pressure Measuring Device
NP	1	Heise gauge H 17805 R, 1300 to 1500 psig
NP	2	Heise gauge H 17805 R, 0 to 1300 psig
NP	3	Heise gauge H 14575, 0 to 250 psig
NP	4	Mercury manometers
NP	5	Water manometers
NQ	1	Vol-O-Flo meter, 30 to 300 cfh
NQ	2	Vol-O-Flo meter, 3 to 30 cfh
NQ	3	Vol-O-Flo meter, 0.3 to 3 cfh
NQ	4	Water-displacement burette
NQ	5	Soap-film gas burette Number 1
NQ	6	Soap-film gas burette Number 2
NQ	7	Wet test meter Number 2

Input of Experimental Flow Data

↓

Calibration and Conversion Factors Applied to Pressure Readings

p_1 , p_2

↓

"QSUB" Subroutine
Solution of Vol-O-Flo Meter Equation or Conversion of Burette Readings

q_{sc}

↓

"ZINTPL" Subroutine
Interpolation at $\bar{p}$ and $\bar{T}$

z

↓

"VINTPL" Subroutine
Interpolation at $\bar{p}$ and $\bar{T}$

μ

↓

"ZKINT" Subroutine
Interpolation at p_r and T_r

$$\int_o^{p_r} \frac{p_r}{z}\, dp_r \quad \text{and} \quad \int_o^{p_r} \frac{p_r}{z\mu_r}\, dp_r$$

↓

Calculation of k_a and $1/\bar{p}$

$$\frac{-M\, g_c \Delta(p^2) A}{2\ zRT\ \mu L\ w} \quad \text{and} \quad \frac{w}{\mu A}$$

↓

Output of Calculated Results

FIGURE 2 SIMPLIFIED COMPUTER FLOW DIAGRAM

In the initial steps of the computational process, absolute values of the upstream pressure, p_1, and the downstream pressure, p_2, were calculated by applying appropriate calibration and conversion factors to the barometric and pressure-gauge readings. The volumetric flow rate at standard conditions, q_{sc}, was calculated either from the solution of the Vol-O-Flo meter Equation (43) or from the conversion of gas-burette readings.

Compressibility Factor and Viscosity Calculation

Values of the compressibility factor for nitrogen[26], at constant temperatures of 62 F, 80 F, 98 F, and 116 F, for various absolute pressures up to 100 atm, were curve-fitted with a third-degree polynomial using least-squares. In the computer program, the "ZINTPL" subroutine was used to calculate compressibility factors at the given pressure from the polynomials. A four-point Lagrangian interpolation procedure was then used to calculate the compressibility factor at the given temperature.

A third-degree polynomial was also used to least-squares fit values of the viscosity of nitrogen [27,28,29] at temperatures of 20 C, 25 C, 50 C, and 75 C, for various

pressures. Although the viscosity data for nitrogen at 25 C, 50 C, and 75 C, was available for pressures up to 200 atm , the data at 20 C was only tabulated up to a pressure of 62 atm. To determine the viscosity of nitrogen at a given pressure and temperature, the same procedure used for the compressibility factor was employed in the "VINTPL" subroutine, namely, polynomial evaluation followed by four-point Lagrangian interpolation.

Evaluation of the Flow-Equation Integrals

Solution of flow Equations (28) and (29) requires the evaluation of the isothermal variation of the compressibility factor with pressure. This was accomplished by computing integrals of the form

$$\text{"XZI"} = \int_0^{p_r} \frac{p_r}{z} \, dp_r \tag{44}$$

Likewise, the isothermal variation of the compressibility factor and the viscosity with pressure, required in Equations (30),(34), (35), and (36), was determined by computing integrals of the form

$$\text{"XKI"} = \int_0^{p_r} \frac{p_r}{z \, \mu_r} \, dp_r \tag{45}$$

The "XZI" and "XKI" integrals were calculated in a separate computer program by a step-wise integration procedure using a nine-point Gauss quadrature method. The values of the compressibility factor and the viscosity at the roots of the corresponding Legendre polynomial were calculated using the "ZINTPL" and "VINTPL" subroutines. Values of the "XZI" and "XKI" integrals were evaluated for reduced temperatures of 2.35, 2.40, 2.45, and 2.50. The integrals were calculated either in reduced pressure increments of 0.002, from 0 to 0.500, or in reduced pressure increments of 0.01, from 0 to 1.85. The "XZI" and "XKI" integrals were then curve fitted by least-squares with a fifth-degree polynomial.

In the computer program for processing the experimental data, values of the "XZI" and "XKI" integrals are provided by interpolation at p_r and T_r in the "ZKINT" subroutine.

DISCUSSION OF EXPERIMENTAL RESULTS

Experimental Equipment

Experimental data obtained at low flow rates are quite scattered, thereby making the determination of the Klinkenberg permeability quite difficult. The source of the noisy data is undoubtedly the measurement of the volumetric flow rate. As can be seen in Figure 3, the data obtained with the low range of the Vol-O-Flo meter did not correspond to that obtained with the gas-burettes. The reason for this discrepancy could not be ascertained when the data was obtained. However, later reflection on the matter resulted in the speculation that the quadratic-flow Equation (38) may not adequately describe gas flow in the meter at low flow rates. Using gas flow in porous media as an analogy, it seems quite likely that prior to the region of applicability of the quadratic flow equation there may be a non-linear type of flow regime. Figure 4, which is a plot of the friction factor-Reynolds number obtained by solving Equations (41) and (42), also exhibits scattering of the calibration data for the low range of the meter. Further calibration of the Vol-O-Flo meter should either substantiate or disprove the preceding explanation of the discrepancies in the low

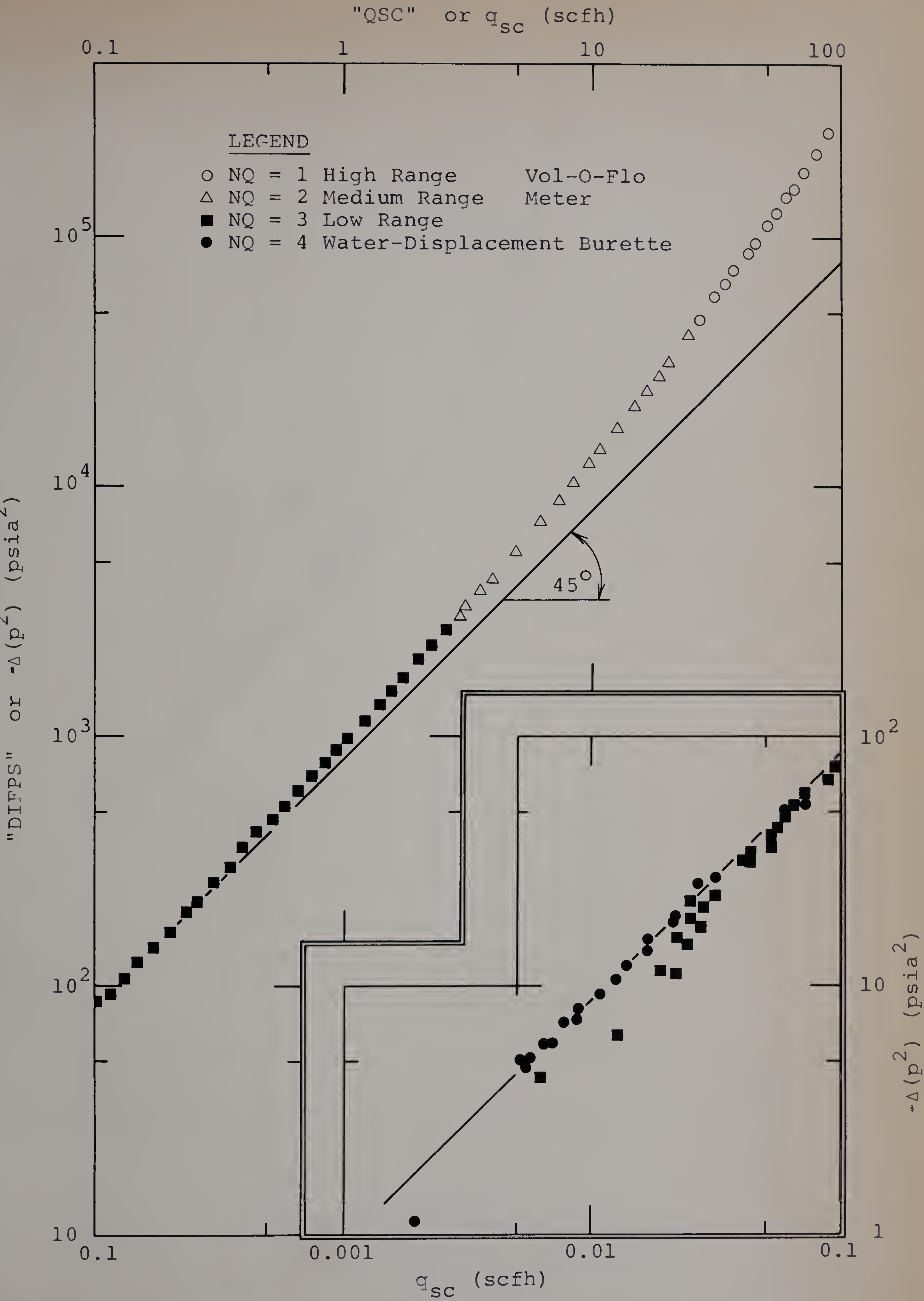

FIGURE 3 PRESSURE DROP CURVE FOR CORE 2

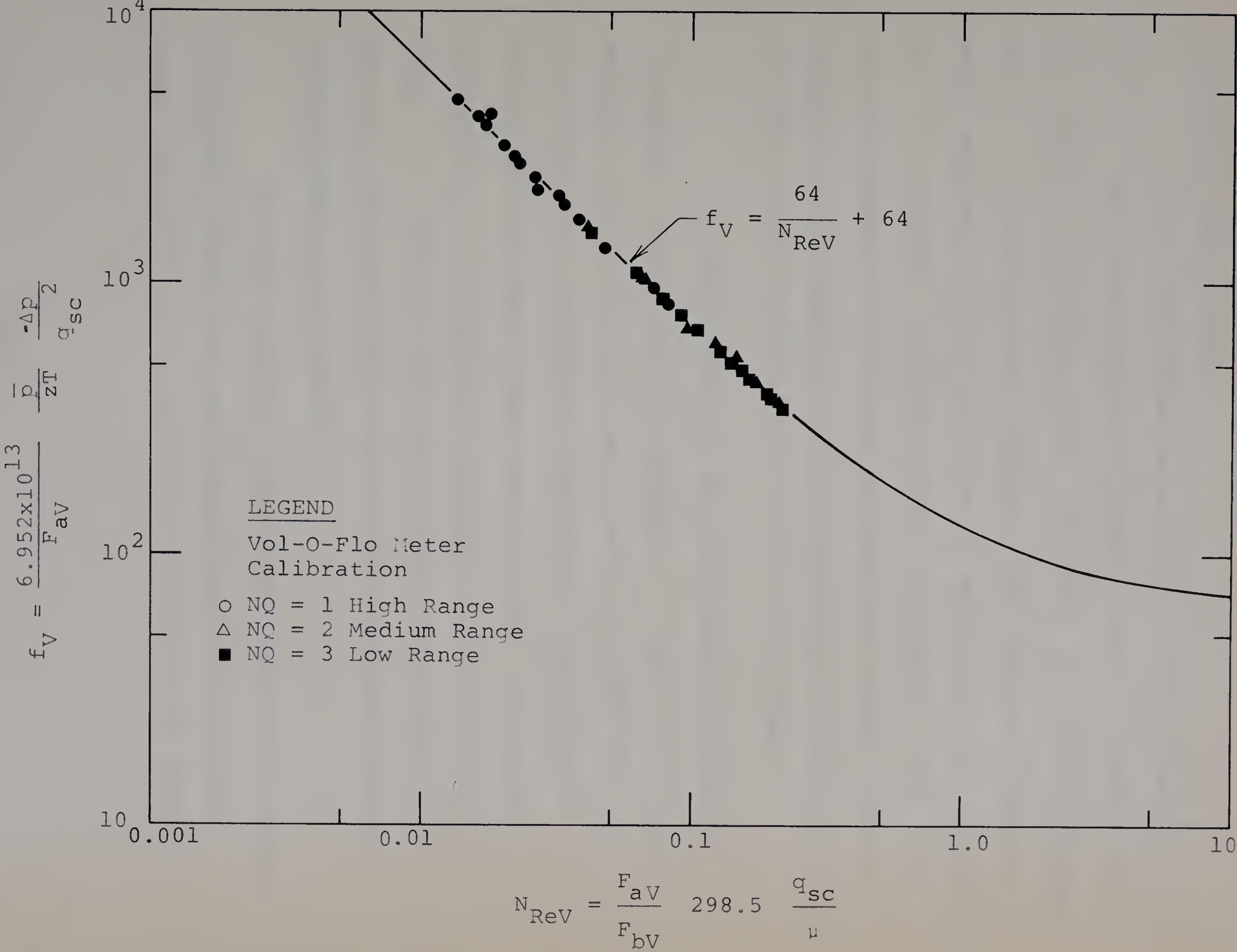

FIGURE 4 FRICTION FACTOR - REYNOLDS NUMBER PLOT FOR THE VOL-O-FLO METER

flow-rate observations.

It may be advisable to modify certain features of the Vol-O-Flo meter measuring system before proceeding with any further calibration work. To obtain an accurate measurement of the mean pressure midway in the orifice elements, a water manometer should be placed in series with the differential oil manostat, shown previously in Figure 1. The flow-line thermometer should also be relocated since it was observed that gas expansion in the thermometer housing produced an appreciable cooling effect at high flow rates.

The calibration of the differential pressure transducer should also be re-examined. Although the operational instructions for the transducer stated that the instrument was temperature compensated, an anomalous change was observed in the output voltage readings obtained with no differential pressure across the transducer. In addition, some type of fail-safe device to prevent pressure overloading of the transducer should be incorporated in the system.

The gas-expansion porosimeter should be modified to provide a more accurate determination of the gross grain volume of the mounted core. Owing to the slope of

the porosimeter calibration curve, a small error in the final expanded pressure reading could result in a substantial error in the calculated value of the pore volume, especially in the case of low porosity cores. The use of tight fitting sleeves to enclose the mounted core or dummy blanks to reduce the excess volume in the core chamber may be sufficient.

To sum up, the following apparent inadequacies of the experimental equipment should be rectified: (1) the Vol-O-Flo meter should be modified and re-calibrated, (2) the differential pressure transducer system should also be modified and re-calibrated, and (3) the gas-expansion porosimeter should be modified.

Gas Flow Tests

Experimental flow tests were conducted on only three of the large limestone cores. Trouble was encountered in obtaining equivalent values of the absolute permeability from the Klinkenberg permeability determination in the viscous flow regime and from the viscous resistance coefficient determination in the visco-inertial flow regime. For example, the graphical solution of the visco-inertial flow Equation (32), shown in Figure 5, yields

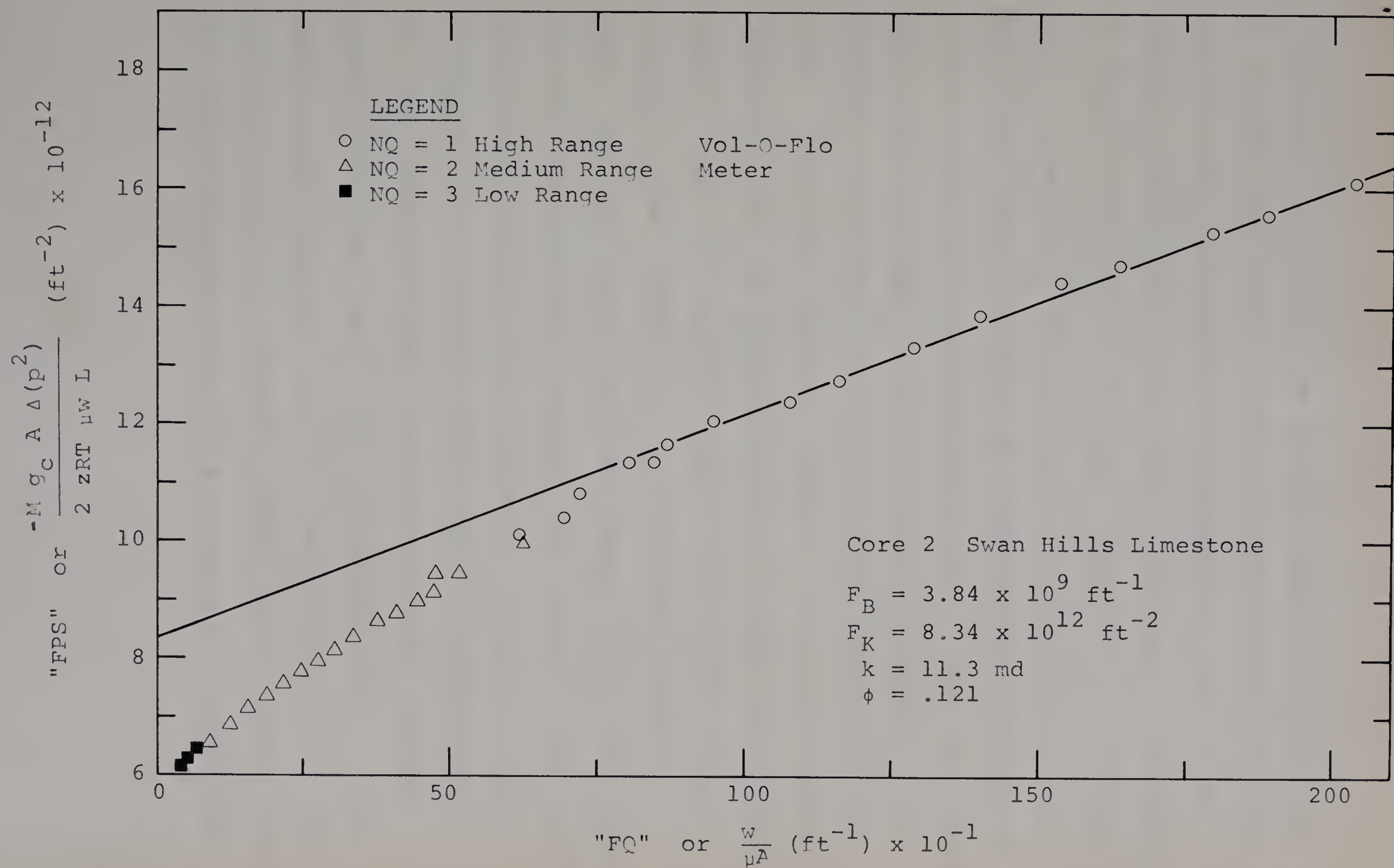

FIGURE 5 FORCHHEIMER EQUATION COEFFICIENTS FOR CORE 2 USING THE HIGH METER RANGE

a value of 11.3 md for the absolute permeability of Core 2. On the other hand, a value of approximately 15 md is obtained from the Klinkenberg permeability plot of the viscous flow Equation (22), shown in Figure 6. As advocated by Dranchuk and Sadiq [24], some interpretation is required in the selection of the location of the probable Klinkenberg curve due to existence of pseudo-linear Klinkenberg curves in the visco-inertial flow regime. Thus, the pressure-drop curve for Core 2, shown previously in Figure 3, was examined to determine the extent of the viscous flow regime. A straight line with a slope of forty-five degrees, indicating that the pressure-squared gradient was proportional to the first power of the volumetric flow rate, was visually fitted through the low flow rate gas-burette data. The gas burette data were assumed to be more accurate than the low flow rate Vol-O-Flo meter data for the reasons previously discussed. The region of linearity in Figure 3 extends up to volumetric flow rates of approximately 0.1 scfh which correspond to reciprocal mean pressures greater than 0.067 psi^{-1} in the Klinkenberg plot. Using points in the viscous flow regime as pivotal points, the probable Klinkenberg curve was drawn slightly higher than the apparent gas permeabilities obtained with some back-

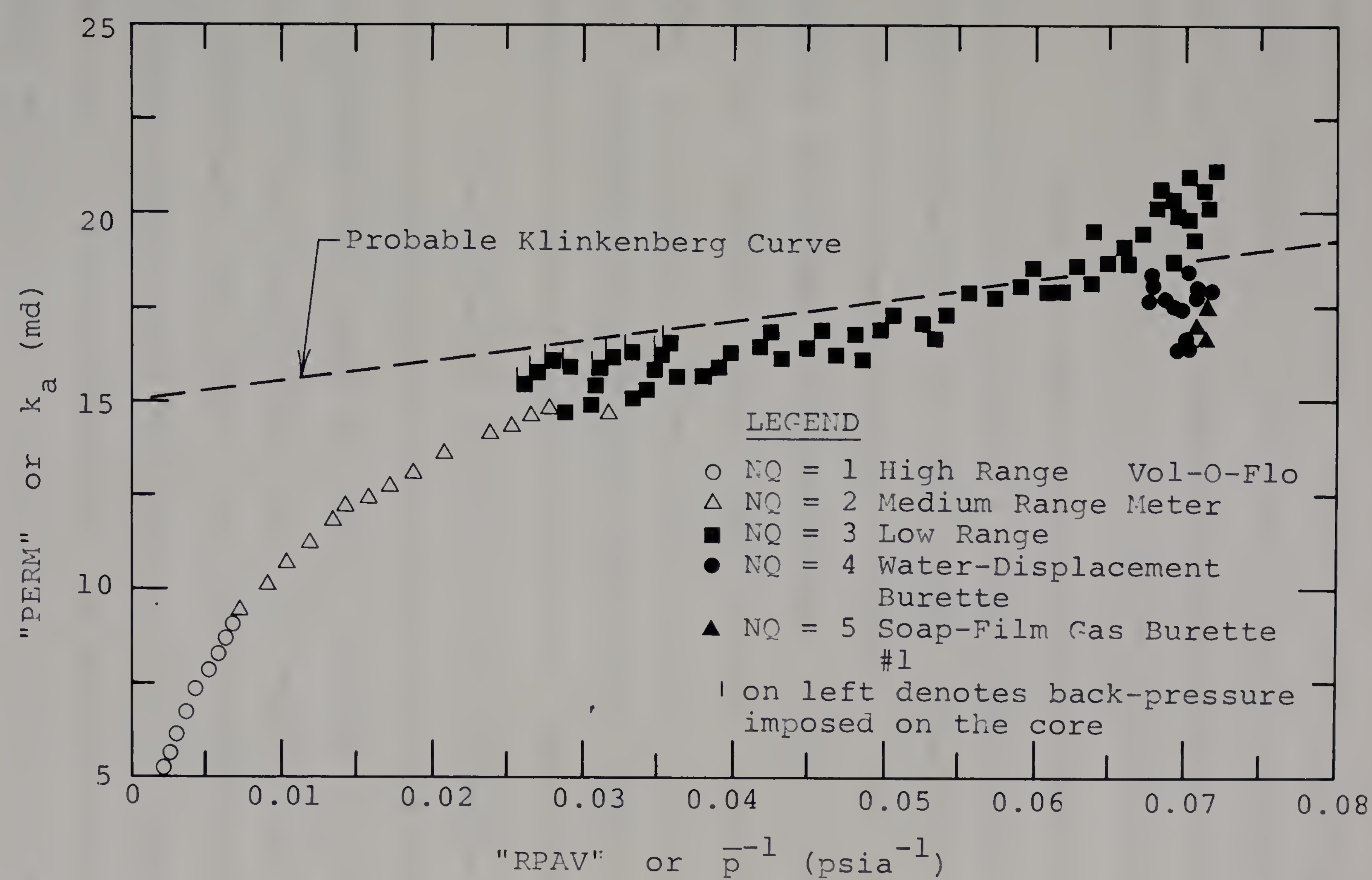

FIGURE 6 KLINKENBERG PERMEABILITY PLOT FOR CORE 2

pressure on the core at reciprocal mean pressures of approximately 0.03 $psia^{-1}$. The choice of the probable Klinkenberg curve will be further substantiated in conjunction with the discussion of Figure 8 which will be presented presently.

Using the absolute permeability and the turbulence factor obtained from Figure 5, values of the friction factor-Reynolds number plot for Core 2 were calculated from Equations (7) and (8) and were plotted in Figure 7. The resultant curve, labelled high range flow parameters, is seen to be very much lower than the theoretical friction factor-Reynolds number relationship. The slight departure of medium range flow parameter curve from the theoretical curve at low Reynolds number were observed in the results of other investigators[4,6].

The anomalous friction factor-Reynolds number results led to a re-examination of the high flow rate data. Since the pressure-drop curve for Core 2, Figure 3, indicated that the flow data obtained with the medium range of the Vol-O-Flo meter were also in the visco-inertial flow regime, the medium range meter data were plotted in Figure 8. The value of 15.1 md determined for the absolute permeability agrees very well with the value of 15 md determined from

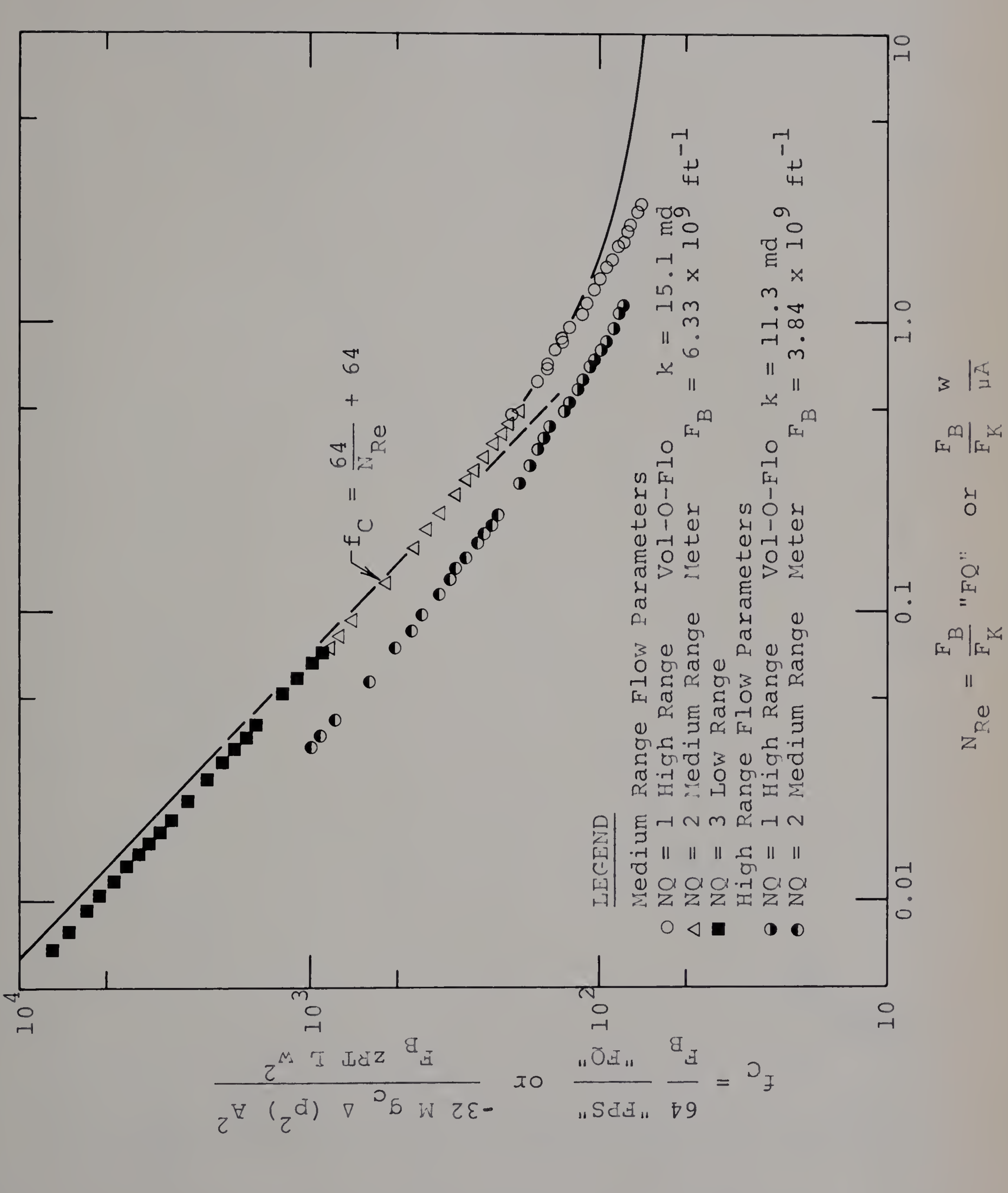

FIGURE 7 FRICTION FACTOR - REYNOLDS NUMBER PLOT FOR CORE 2

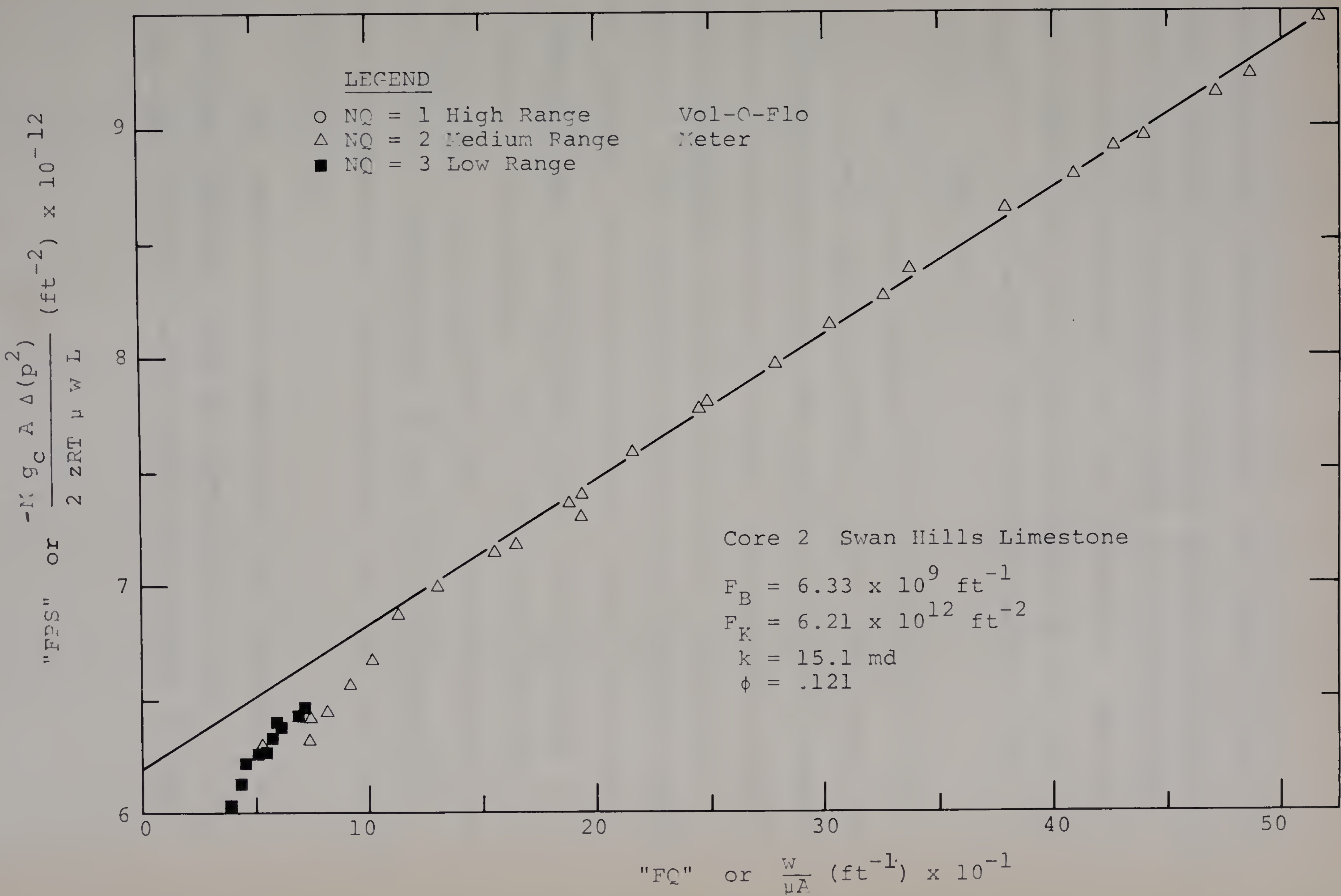

FIGURE 8 FORCHHEIMER EQUATION COEFFICIENTS FOR CORE 2 USING MEDIUM METER RANGE

the Klinkenberg permeability plot. The results of the flow tests conducted on Core 3 indicated similar anomalous results obtained using the high meter range as can be seen from examination of Figures 9 to 13 in Appendix I. The flow test results for Core 1, shown in Figures 14 to 17 in Appendix I, are somewhat less conclusive owing to the scatter of data points.

Thus, it was concluded that the high range of the Vol-O-Flo meter yielded incorrect results. The reason for the anomalous high range flow results could not be ascertained. An examination of Figure 4 indicated that there was good agreement between the calculated calibration points and the theoretical friction factor-Reynolds number relationship for the Vol-O-Flo meter. Hence, it is recommended that the high range of the Vol-O-Flo meter should be re-calibrated. It is also recommended that the friction factor-Reynolds number curves should be used as a test of compatibility of the absolute permeability and the turbulence factor determined from the visco-inertial gas flow test.

The results of the experimental test conducted on the three limestone cores are summarized in Table 2. The high range Vol-O-Flo meter results are included in Table

TABLE 2

SUMMARY OF THE LIMESTONE CORE PROPERTIES

Core	Length (in)	Cross-Sectional Area (sq in)	Effective Porosity	Absolute Permeability (md) Klinkenberg Plot	Absolute Permeability (md) Visco-Inertial Flow Plot Medium Range	Absolute Permeability (md) Visco-Inertial Flow Plot High Range	Turbulence Factor (ft^{-1}) Medium Range	Turbulence Factor (ft^{-1}) High Range
1*	3.9956	9.5799	0.113	390	390		9.49×10^7	
2	5.9680	9.5153	0.121	15	15.1	11.3	6.33×10^9	3.84×10^9
3	7.8340	9.1327	0.141	21	20.9	14.5	5.43×10^9	1.83×10^9

* The Forchheimer equation coefficients for core 1 were obtained from a composite plot of the medium range and the high range Vol-O-Flo data.

2 for the sake of comparison.

As an additional check on the accuracy of the experimental results, the absolute permeability, turbulence factor and effective porosity values were plotted in Figures 18, 19, and 20, along with the results of other investigators[4,5,6,7,10,12,13,14,17]. The absolute permeabilities and the turbulence factors appear to be consistent with the results of other investigators. Examination of Figure 18 indicates that the effective porosity of Core 1 appears to be somewhat lower than normal. Although the effective porosities of Core 2 and 3 appear to be of the correct order of magnitude, a re-evaluation of the effective porosities in the modified porosimeter is recommended in lieu of the apparent discrepancy of the effective porosity of Core 1.

The plot of the turbulence factors versus the effective porosity-permeability function [3], in Figure 20, shows that there is no significant difference between the data for the limestone cores and the data for sandstone cores. A curve described by the following equation was visually fitted through the data plotted in Figure 20.

$$F_B = 1.175 \times 10^5 \, (\phi^5 \ k^{\frac{1}{2}})^{-1.18} \qquad (46)$$

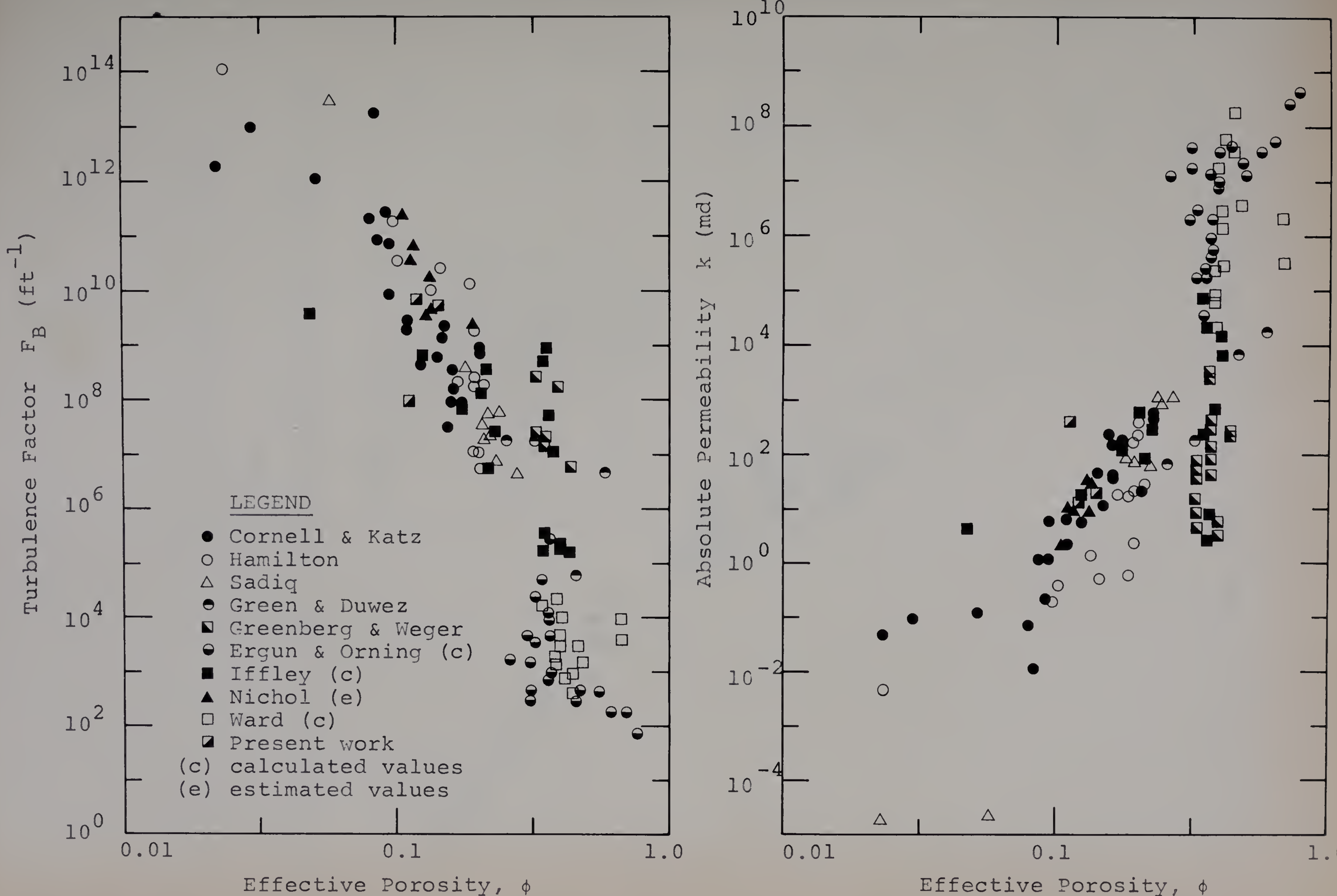

FIGURE 18 VARIATION OF TURBULENCE FACTOR AND PERMEABILITY WITH POROSITY

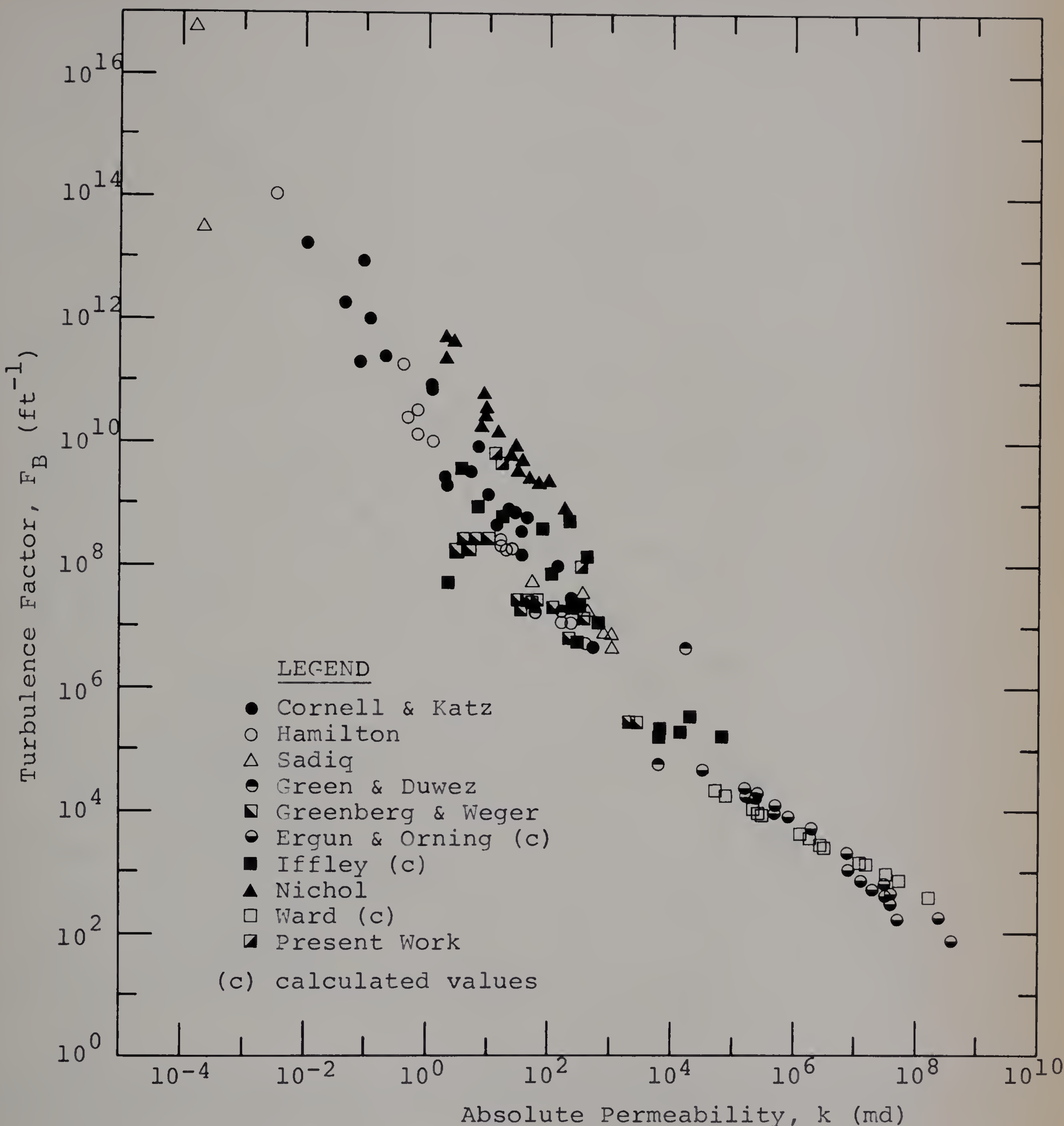

FIGURE 19 CORRELATION OF PERMEABILITY WITH TURBULENCE FACTOR

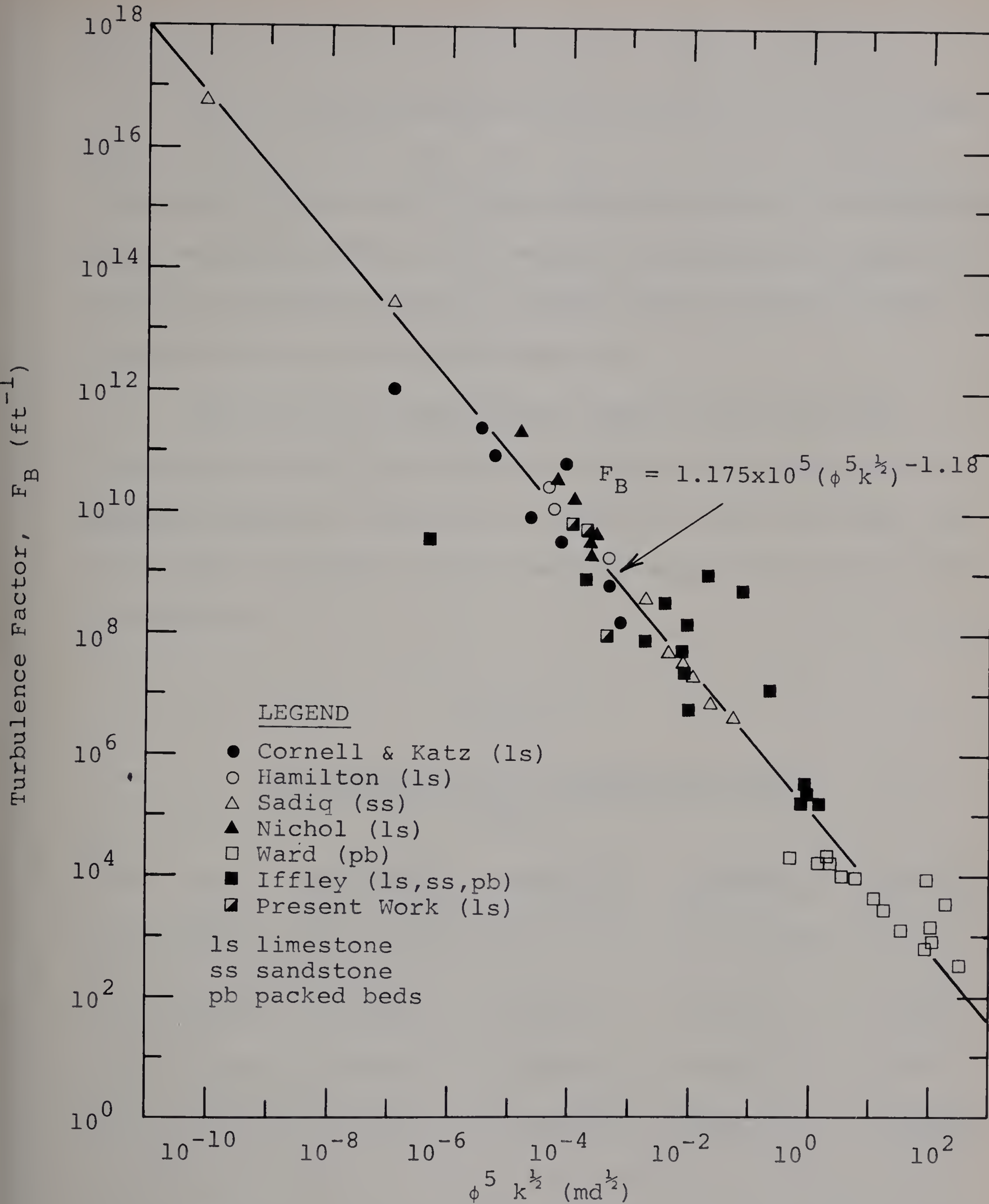

FIGURE 20 TURBULENCE FACTOR VERSUS POROSITY-PERMEABILITY FUNCTION

or

$$F_B = 1.175 \times 10^5 \ \phi^{-5.90} \ k^{-0.59} \tag{47}$$

Since the fifth power of the effective porosity is employed as a weighting factor, the excessive deviation of some of the data from the curve is probably due to slight errors in the effective porosity determination.

The value of the present absolute permeability, turbulence factor and effective porosity correlations is somewhat doubtful since the turbulence factor can only be estimated to within a few orders of magnitude, as is shown in Table 3.

Table 3

ESTIMATION OF THE TURBULENCE FACTOR
(ft^{-1})

Core	F_B (exp.)	$\frac{1.175\times10^5}{\phi^{5.90}\ k^{0.59}}$	$\frac{1.617\times10^5}{\phi^{5.07}k^{0.50}}$	$\frac{6.6\times10^7}{\phi^{2.76}k^{1.13}}$	$\frac{5.5\times10^9}{\phi^{0.75}k^{1.25}}$
1	9.49×10^7	1.39×10^9	5.19×10^8	3.16×10^7	1.64×10^7
2	6.33×10^9	6.10×10^9	2.39×10^9	1.04×10^9	9.00×10^8
3	5.43×10^9	2.17×10^9	7.55×10^8	4.87×10^8	5.38×10^8

Although the values of the effective porosity may be slightly in error, the various proposed correlations yield answers which vary over several orders of magnitude for the same core. The only conclusion that can be inferred from such correlations is that the turbulence factor generally decreases as the absolute permeability and the effect porosity increase. The significance of other weighting factors such as the dead-end porosity and internal surface area of a porous medium should be investigated.

The solution of the viscous gas flow equations using average fluid properties did not differ significantly from the solutions employing integrals to express the isothermal variation of the viscosity and the compressibility factor with pressure. Complete tabulated results of the flow tests are given in Appendix I, but some selected values are shown in Table 4. Calculated values of the apparent gas permeability, "PERMI" from Equation (30), are only very slightly different from the values of "PERMZ" and "PERM", calculated from Equation (28) and (27). However, the differences in the calculated values of the apparent gas permeabilities are insignificant when compared with the magnitude of the scatter in the Klinkenberg permeability plots.

TABLE 4

SOME APPARENT GAS PERMEABILITY RESULTS FOR CORE 3

Run	Volumetric Flow Rate "QCS" (scfh)	Reciprocal Mean Pressure "RPAV" ($psia^{-1}$)	Apparent Gas Permeability "PERM" (md)	"PERMZ" (md)	"PERMI" (md)
1	.0057	.07291	26.86	26.86	26.80
18	.0658	.06780	26.18	26.18	26.16
36	1.726	.05198	25.62	25.62	25.61
48	2.549	.02943	20.87	20.87	20.87
55	4.313	.01405	15.80	15.79	15.81
60	8.705	.00912	13.18	13.18	13.21
180	.0543	.02980	24.24	24.24	24.24
200	.0737	.07429	27.68	27.68	29.66
250	.0213	.07258	27.17	27.17	27.01

When a slight temperature gradient exists across the core, as experienced in Runs 200 and 250, the apparent gas permeability "PERMI" differs from values of "PERMZ" and "PERM". A similar trend was noted in the "FIPS" values at high rates of flow where gas expansion effects are prevalent. Since

the viscosity of nitrogen is more temperature sensitive than the compressibility factor, the difference between the "PERMI" and the "PERMZ" values is probably due to the difference between the upstream and downstream flowing gas temperatures and the average flowing gas temperature.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

(1) The compatibility of the absolute permeability and the turbulence factor values obtained from the graphical solution of the Forchheimer equation can be qualitatively checked using the friction factor-Reynolds number plot.

(2) The turbulence factor can only be estimated to within a few orders of magnitude of the experimentally determined value using present correlations of the absolute permeability, turbulence factor and effective porosity.

(3) The absolute permeability, turbulence factor and effective porosity values for limestone cores are consistent with similar values for sandstone cores. The turbulence factor generally decreases as the absolute permeability and the effective porosity increase.

(4) The values of the apparent gas permeability calculated using average fluid properties did not differ appreciably from the values obtained using integrals to express the isothermal variation of the viscosity and the compressibility factor with pressure.

Recommendations

(1) The Vol-O-Flo meter should be modified and re-calibrated.

(2) The differential pressure transducer should also be modified and re-calibrated.

(3) The gas-expansion porosimeter should be modified.

(4) The significance of other weighting factors, such as the dead-end porosity and internal surface area of a porous medium, should be investigated for the purpose of correlating the absolute permeability and the turbulence factor.

NOMENCLATURE

Where it was possible, standard letter symbols (30) were used in the text of this thesis. The multiple subscript notation may be somewhat irregular, but the unconventional forms were required in order to avoid confusion. However, an explanation immediately follows any irregular usage of a standard symbol. Unconventional units of variables in equations are also explicitly stated.

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A P P E N D I X   I

GAS FLOW TEST RESULTS

Graphical Results

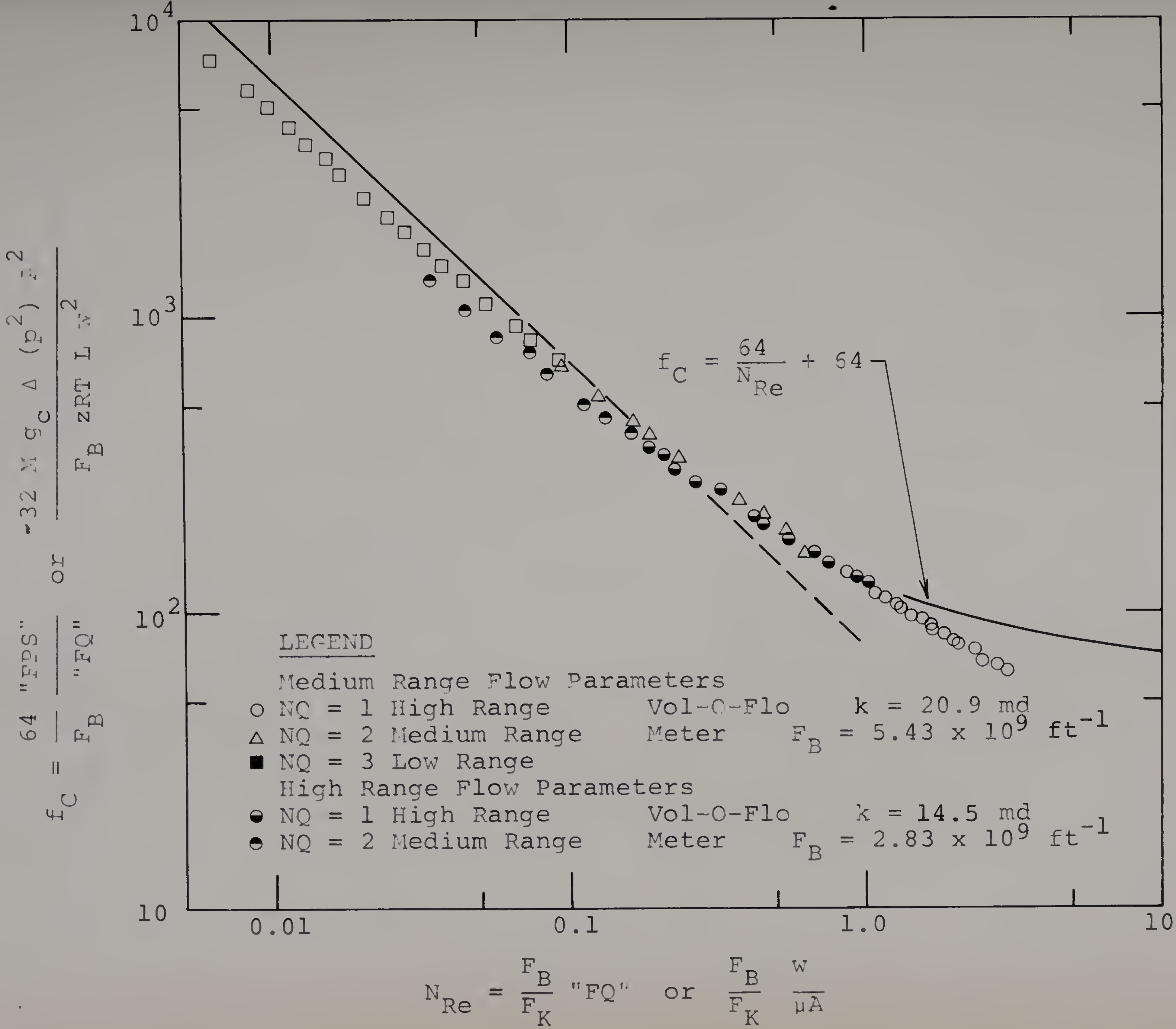

FIGURE 9 FRICTION FACTOR - REYNOLDS NUMBER PLOT FOR CORE 3

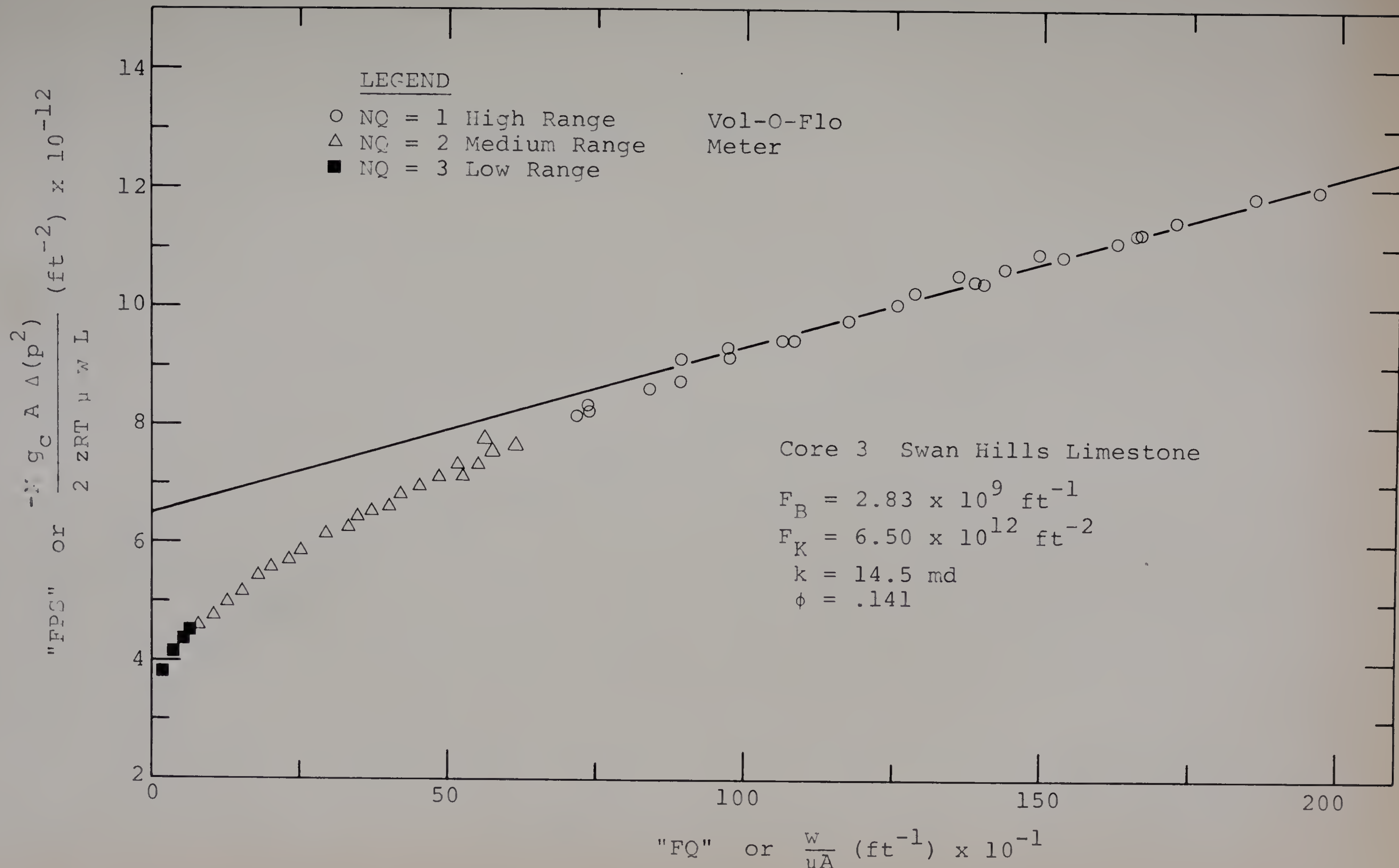

FIGURE 10 FORCHHEIMER EQUATION COEFFICIENTS FOR CORE 3 USING THE HIGH METER RANGE

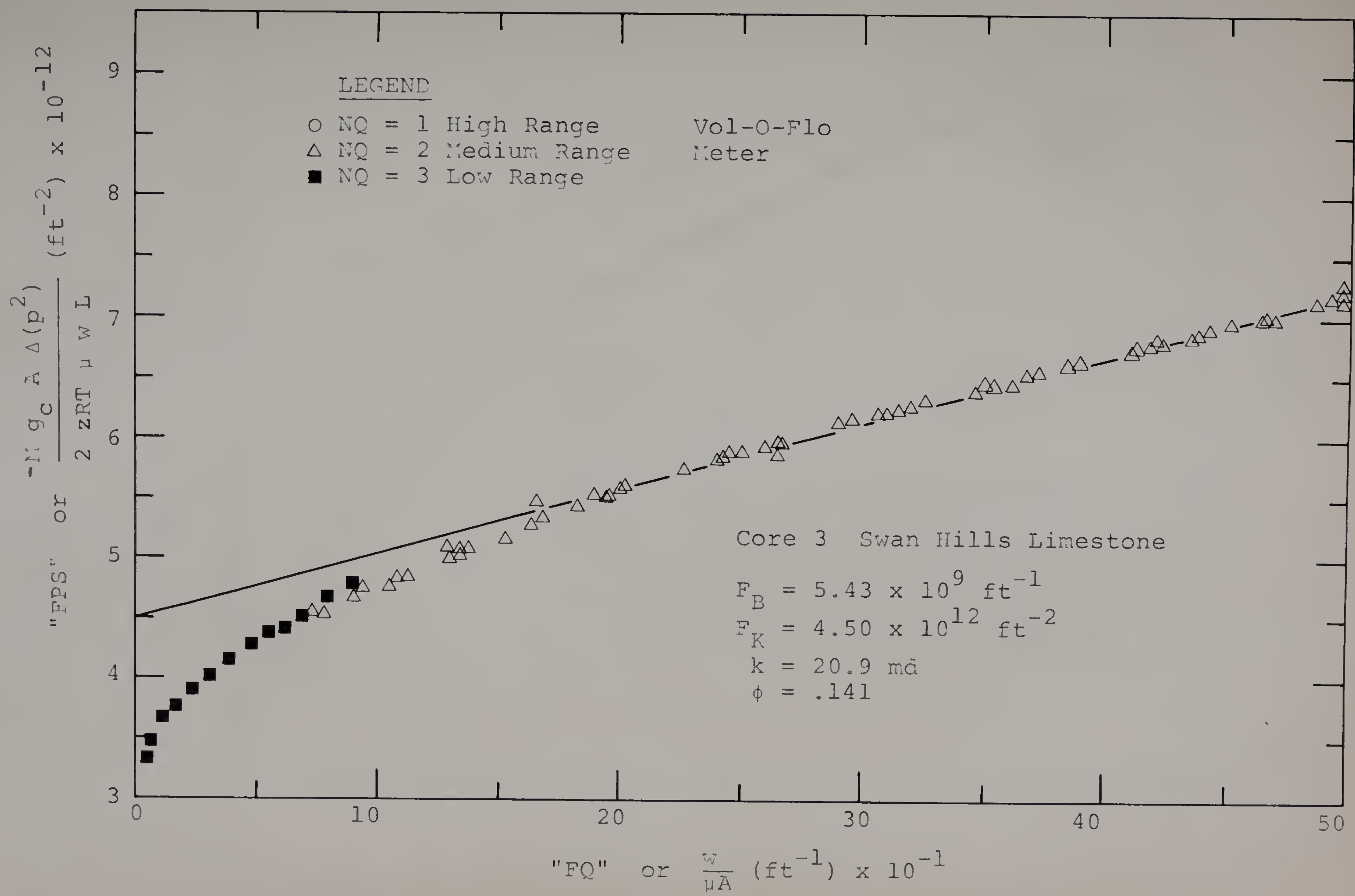

FIGURE 11 FORCHHEIMER EQUATION COEFFICIENTS FOR CORE 3 USING THE MEDIUM METER RANGE

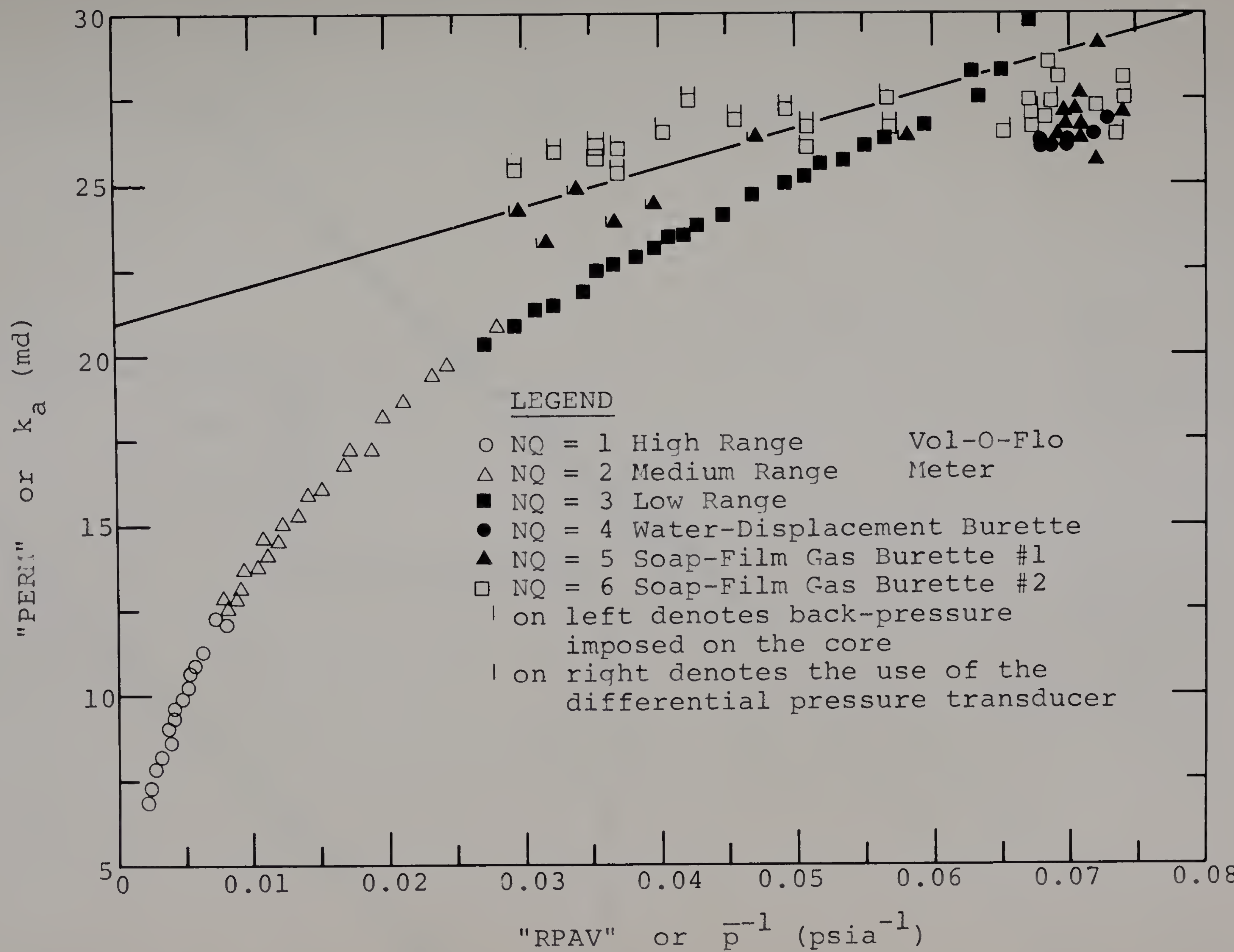

FIGURE 12 KLINKENBERG PERMEABILITY PLOT FOR CORE 3

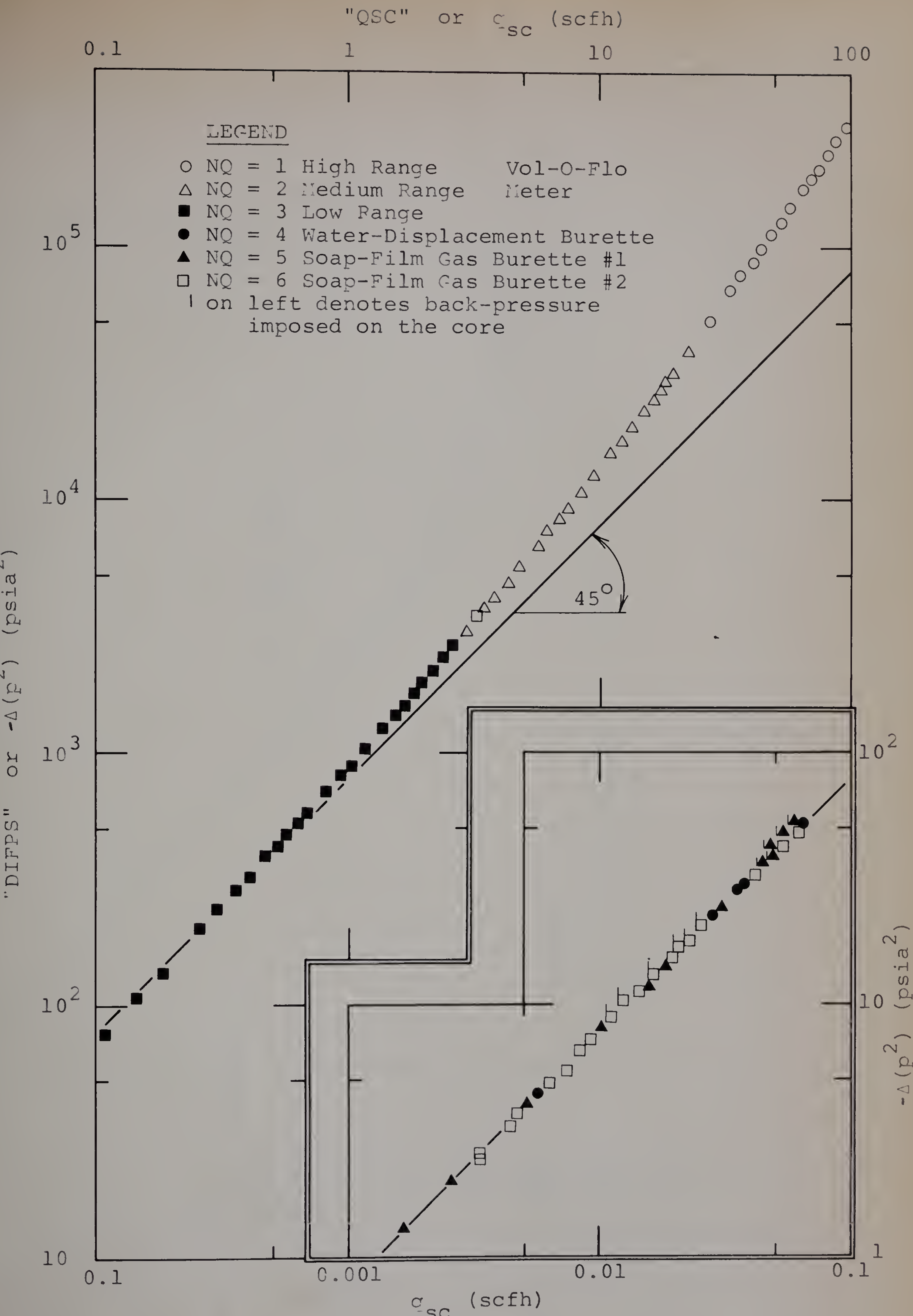

FIGURE 13 PRESSURE-DROP CURVE FOR CORE 3

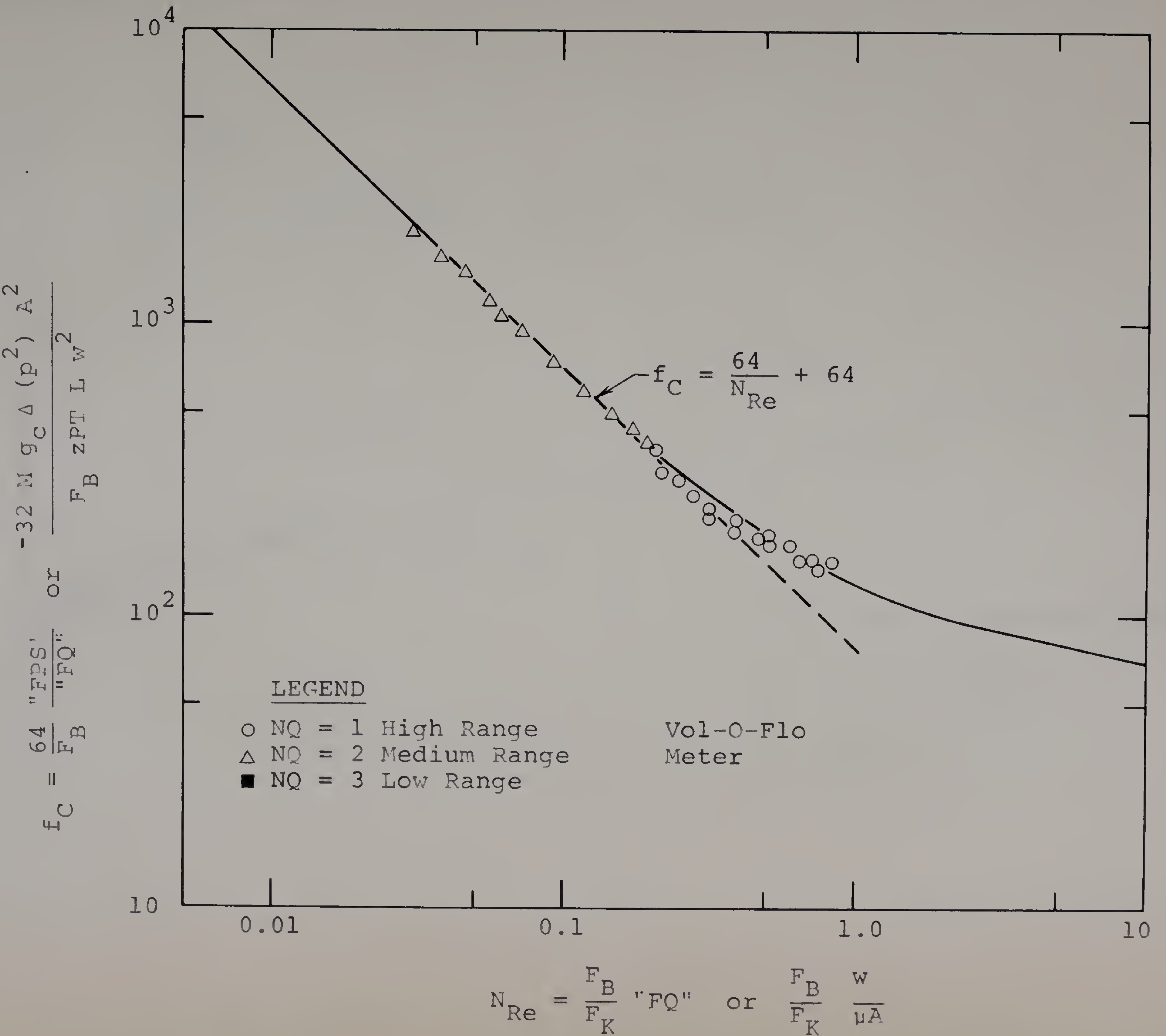

FIGURE 14 FRICTION FACTOR - REYNOLDS NUMBER PLOT FOR CORE 1

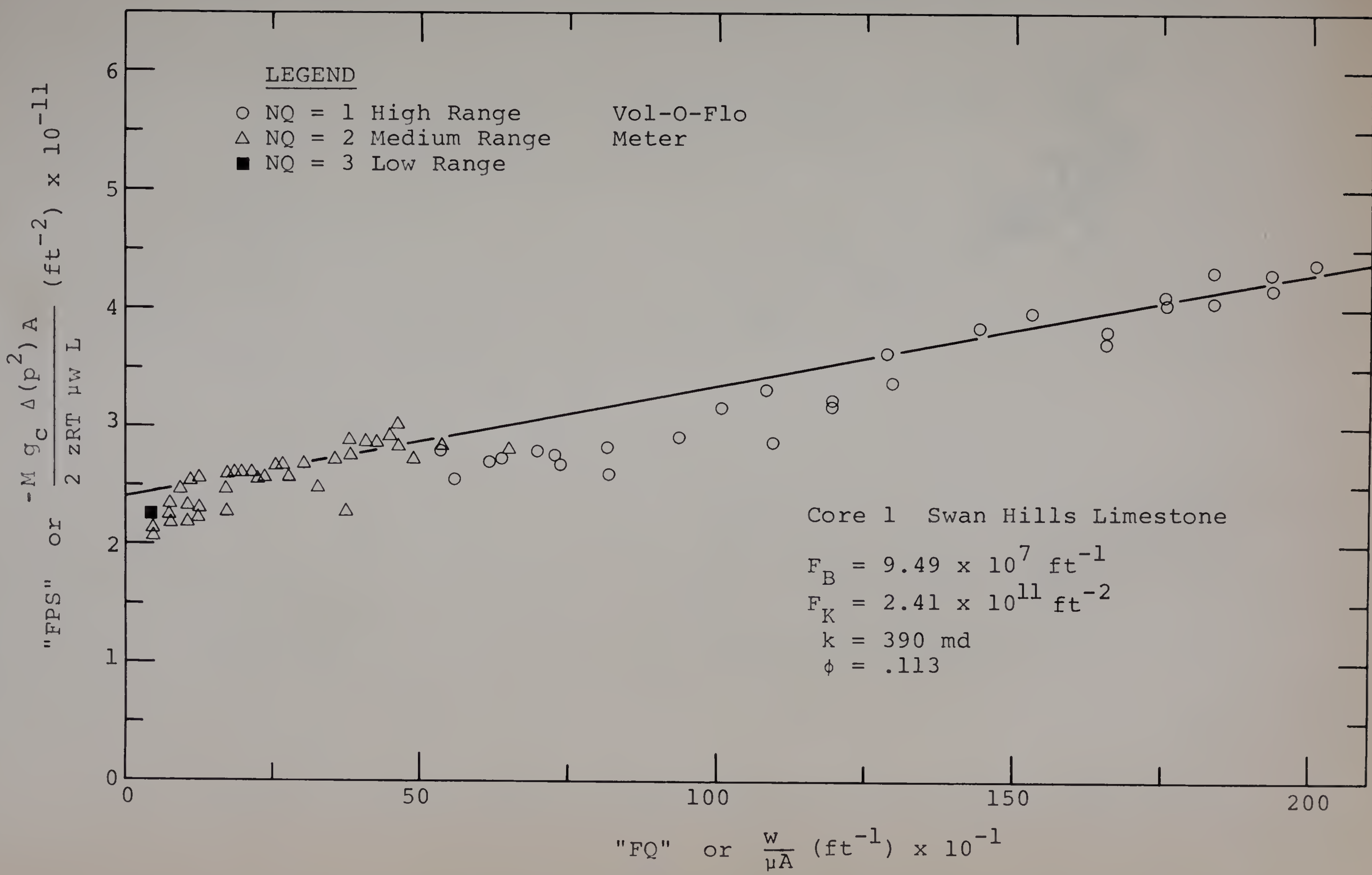

FIGURE 15 DETERMINATION OF THE FORCHHEIMER EQUATION COEFFICIENTS FOR CORE 1

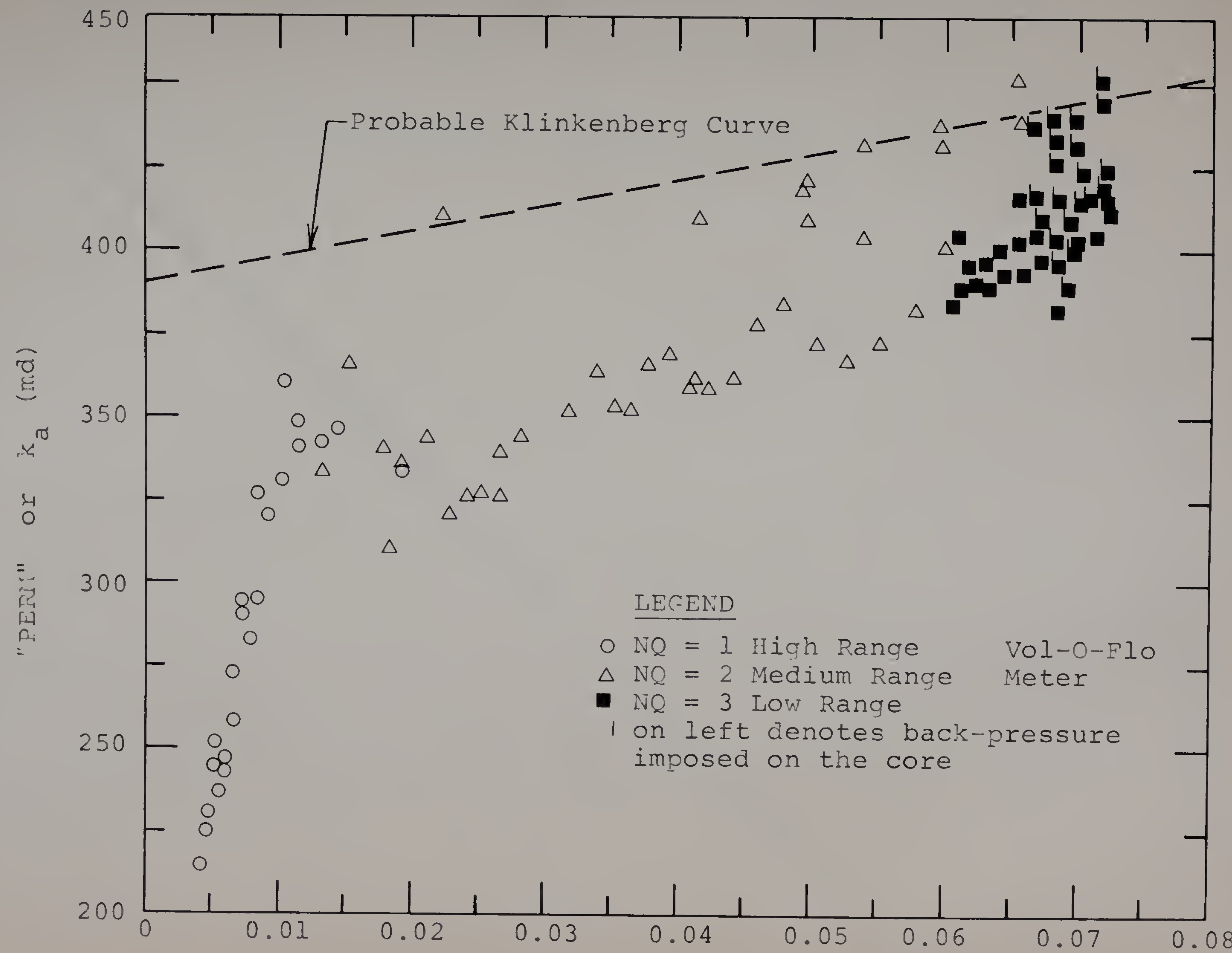

FIGURE 16 KLINKENBERG PERMEABILITY PLOT FOR CORE 1

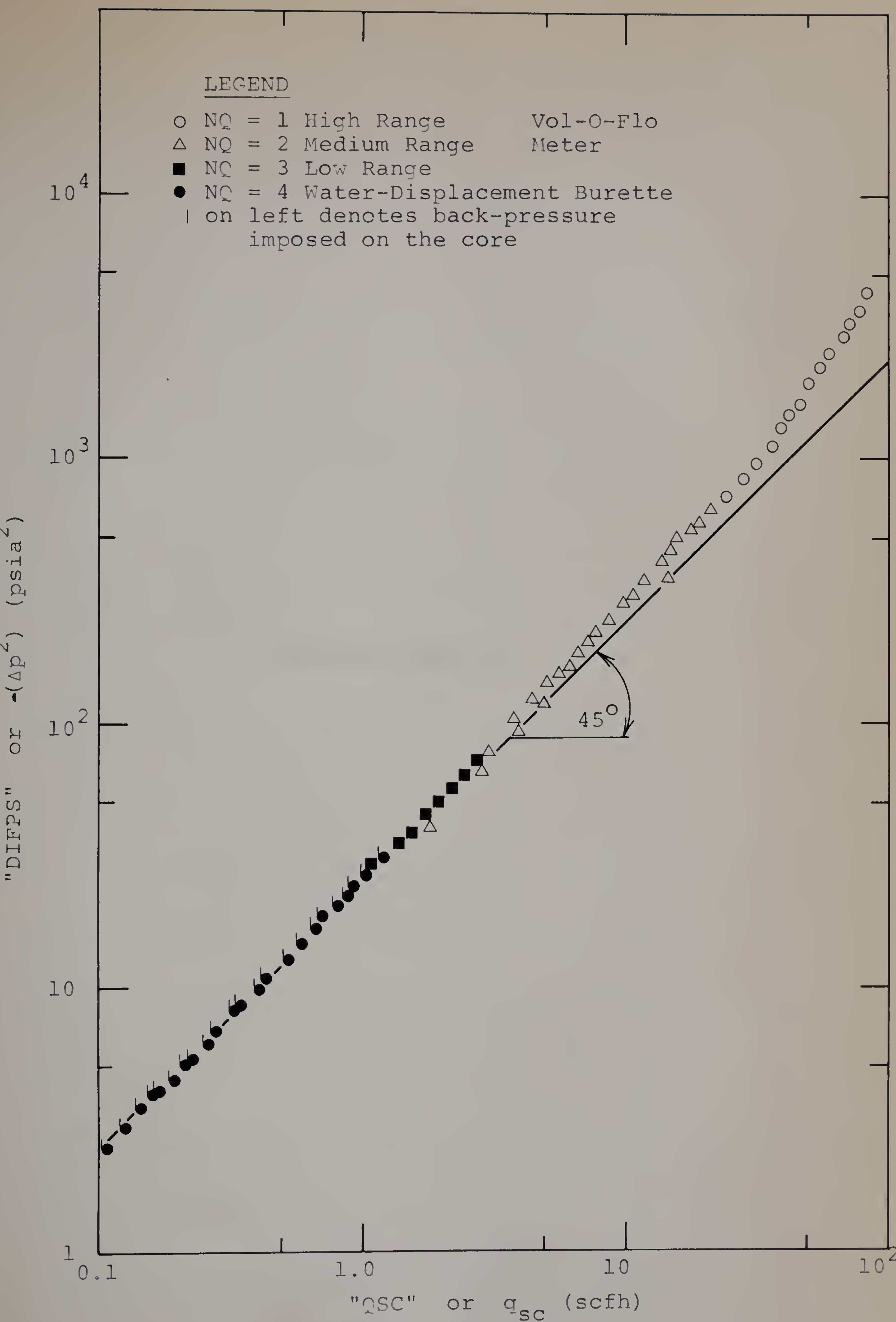

FIGURE 17 PRESSURE-DROP CURVE FOR CORE 1

Tabulated Results

TABLE 5 EXPERIMENTAL GAS FLOW DATA FOR CORE 1

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
1	17.44	15.21	535.30	535.55	0.727E 02	0.278E 01	177.52	177.30
2	17.44	15.22	535.30	535.55	0.726E 02	0.278E 01	177.52	177.30
3	17.08	15.01	535.30	535.55	0.666E 02	0.255E 01	177.52	177.28
4	17.09	15.01	535.30	535.55	0.669E 02	0.255E 01	177.52	177.28
5	16.74	14.82	535.48	535.62	0.605E 02	0.232E 01	177.55	177.40
6	16.36	14.63	535.44	535.62	0.536E 02	0.207E 01	177.54	177.34
7	16.37	14.64	535.44	535.62	0.536E 02	0.207E 01	177.54	177.34
8	15.90	14.41	535.62	535.83	0.453E 02	0.175E 01	177.58	177.32
9	15.90	14.41	535.62	535.83	0.453E 02	0.175E 01	177.58	177.32
10	15.51	14.22	535.62	535.83	0.383E 02	0.148E 01	177.58	177.28
11	15.50	14.22	535.62	535.83	0.381E 02	0.148E 01	177.58	177.27
12	15.50	14.22	535.62	535.83	0.381E 02	0.148E 01	177.58	177.27
13	15.08	14.04	535.62	535.79	0.302E 02	0.118E 01	177.57	177.26
14	15.08	14.04	535.62	535.79	0.302E 02	0.118E 01	177.57	177.26
15	14.71	13.90	535.62	535.86	0.232E 02	0.917E 00	177.58	177.04
16	14.71	13.90	535.62	535.86	0.232E 02	0.917E 00	177.58	177.04
17	14.33	13.76	535.75	535.93	0.159E 02	0.633E 00	177.60	177.06
18	14.33	13.76	535.75	535.93	0.159E 02	0.633E 00	177.60	177.06
19	13.96	13.65	535.69	535.93	0.849E 01	0.344E 00	177.59	176.22
20	13.96	13.64	539.08	539.36	0.891E 01	0.357E 00	178.44	176.94
21	13.96	13.77	539.15	539.54	0.543E 01	0.229E 00	178.47	175.11
22	13.96	13.83	539.22	539.54	0.356E 01	0.145E 00	178.48	174.28
25	14.34	13.74	539.60	539.85	0.168E 02	0.670E 00	178.57	177.84
26	14.34	13.81	539.64	540.02	0.148E 02	0.589E 00	178.59	177.31
27	14.34	13.88	539.77	540.13	0.129E 02	0.524E 00	178.62	177.28
28	14.34	13.96	539.77	540.13	0.109E 02	0.439E 00	178.62	177.02
29	14.34	14.04	539.91	540.23	0.861E 01	0.350E 00	178.65	176.82
30	14.34	14.10	539.91	540.30	0.688E 01	0.282E 00	178.66	175.86
31	14.34	14.20	539.98	540.37	0.387E 01	0.163E 00	178.68	173.73
32	14.34	14.29	540.02	540.44	0.128E 01	0.543E-01	178.69	163.24
34	14.75	13.97	535.37	535.62	0.223E 02	0.891E 00	177.52	176.95
35	14.75	14.04	535.58	535.86	0.204E 02	0.816E 00	177.58	176.87
36	14.75	14.10	535.79	536.07	0.186E 02	0.710E 00	177.63	176.85
37	14.75	14.22	535.93	536.21	0.154E 02	0.624E 00	177.66	176.71
38	14.75	14.31	536.03	536.42	0.128E 02	0.523E 00	177.70	176.14
39	14.75	14.41	536.21	536.56	0.984E 01	0.403E 00	177.74	175.87
40	14.75	14.54	536.34	536.73	0.616E 01	0.262E 00	177.78	174.50
41	14.75	14.65	536.52	536.83	0.298E 01	0.128E 00	177.81	172.29
43	14.00	13.68	538.15	538.50	0.882E 01	0.356E 00	178.22	175.33
44	14.00	13.84	538.25	538.50	0.448E 01	0.194E 00	178.23	175.59

TABLE 5 EXPERIMENTAL GAS FLOW DATA FOR CORE 1
(CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
45	14.00	13.91	538.35	538.67	0.249E 01	0.109E 00	178.26	172.28
47	14.37	13.78	538.60	538.91	0.168E 02	0.674E 00	178.33	177.40
48	14.37	13.91	538.70	539.02	0.129E 02	0.518E 00	178.35	177.13
49	14.37	14.08	538.77	539.12	0.822E 01	0.331E 00	178.37	176.23
50	14.37	14.24	538.84	539.16	0.387E 01	0.163E 00	178.39	174.30
52	14.74	13.89	540.81	540.96	0.241E 02	0.931E 00	178.86	178.55
53	14.74	14.06	540.88	541.06	0.195E 02	0.764E 00	178.88	178.40
54	14.74	14.21	540.85	541.06	0.151E 02	0.593E 00	178.88	178.14
55	14.74	14.40	540.98	541.10	0.990E 01	0.397E 00	178.90	178.31
56	14.74	14.56	541.02	541.17	0.525E 01	0.216E 00	178.91	177.44
58	15.11	14.03	541.12	541.37	0.312E 02	0.120E 01	178.95	178.53
59	15.10	14.20	541.23	541.44	0.265E 02	0.103E 01	178.97	178.54
60	15.10	14.39	541.33	541.58	0.212E 02	0.830E 00	179.01	178.37
61	15.10	14.60	541.33	541.58	0.150E 02	0.589E 00	179.01	178.09
62	15.10	14.79	541.37	541.61	0.914E 01	0.367E 00	179.02	177.50
63	15.10	14.96	541.50	541.68	0.406E 01	0.171E 00	179.04	176.56
65	15.10	14.10	536.73	536.94	0.293E 02	0.109E 01	177.85	177.47
66	15.10	14.16	536.66	536.94	0.274E 02	0.109E 01	177.84	177.30
67	15.28	14.25	536.83	537.32	0.303E 02	0.122E 01	177.91	177.04
68	15.52	14.35	537.18	537.46	0.350E 02	0.138E 01	177.98	177.53
69	15.73	14.45	537.42	537.67	0.385E 02	0.152E 01	178.03	177.67
70	15.93	14.54	537.59	537.84	0.421E 02	0.166E 01	178.08	177.74
71	16.17	14.66	537.70	537.94	0.466E 02	0.181E 01	178.11	177.79
72	16.38	14.77	537.90	538.08	0.502E 02	0.196E 01	178.15	177.94
73	16.57	14.86	538.01	538.19	0.536E 02	0.208E 01	178.18	177.97
74	16.73	14.93	538.11	538.33	0.569E 02	0.220E 01	178.21	177.97
75	16.95	15.06	538.25	538.36	0.606E 02	0.235E 01	178.23	178.12
76	17.16	15.17	538.42	538.50	0.642E 02	0.247E 01	178.27	178.20
77	17.38	15.35	538.46	538.60	0.666E 02	0.262E 01	178.29	178.15
78	17.59	15.35	538.70	539.09	0.737E 02	0.275E 01	178.38	178.03
79	17.84	15.50	538.80	538.85	0.780E 02	0.289E 01	178.37	178.33
80	17.84	15.50	538.80	538.85	0.780E 02	0.304E 01	178.37	178.33
81	18.79	15.81	539.91	539.99	0.103E 03	0.382E 01	178.65	178.60
82	19.85	16.46	539.95	539.99	0.123E 03	0.445E 01	178.67	178.64
83	20.86	17.14	539.95	539.99	0.142E 03	0.503E 01	178.68	178.65
84	21.82	17.91	540.02	539.92	0.155E 03	0.560E 01	178.68	178.75
85	22.89	18.91	540.05	540.02	0.166E 03	0.619E 01	178.71	178.73
86	23.85	19.68	540.19	540.02	0.182E 03	0.666E 01	178.74	178.85
87	24.90	20.36	540.29	540.02	0.206E 03	0.721E 01	178.76	178.93
88	25.91	21.20	540.33	540.09	0.222E 03	0.771E 01	178.78	178.93

TABLE 5 EXPERIMENTAL GAS FLOW DATA FOR CORE 1 (CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
89	26.98	22.13	540.36	540.09	0.238E 03	0.827E 01	178.79	178.97
90	27.98	23.18	540.50	540.06	0.246E 03	0.877E 01	178.82	179.12
91	28.93	23.99	540.50	540.13	0.261E 03	0.925E 01	178.84	179.09
92	30.01	24.75	540.64	540.09	0.288E 03	0.980E 01	178.86	179.22
93	31.02	25.68	540.64	540.23	0.303E 03	0.103E 02	178.88	179.16
94	32.06	26.83	540.74	540.30	0.308E 03	0.108E 02	178.92	179.23
95	34.17	28.60	540.85	540.27	0.350E 03	0.119E 02	178.94	179.36
97	38.29	32.39	540.85	540.27	0.417E 03	0.139E 02	178.98	179.43
98	40.42	34.36	540.85	540.23	0.453E 03	0.148E 02	179.00	179.48
99	40.68	34.36	540.85	540.23	0.474E 03	0.148E 02	179.00	179.46
100	42.78	36.43	540.88	540.33	0.502E 03	0.158E 02	179.04	179.47
101	44.58	38.17	540.88	540.23	0.530E 03	0.167E 02	179.04	179.58
102	46.78	40.26	540.98	540.23	0.567E 03	0.176E 02	179.08	179.72
103	50.27	44.17	540.92	540.27	0.576E 03	0.191E 02	179.11	179.75
104	54.78	48.53	540.98	540.27	0.646E 03	0.210E 02	179.16	179.92
105	54.78	48.53	540.98	540.27	0.646E 03	0.209E 02	179.16	179.92
106	71.52	66.27	540.98	540.27	0.723E 03	0.242E 02	179.34	180.54
107	79.97	74.47	540.98	540.27	0.849E 03	0.273E 02	179.42	180.71
108	248.97	240.17	530.44	529.43	0.430E 04	0.827E 02	178.49	182.10
109	249.97	241.27	530.44	529.43	0.427E 04	0.827E 02	178.50	182.17
110	236.97	229.07	530.72	529.33	0.368E 04	0.783E 02	178.38	183.80
112	227.97	220.07	530.82	529.15	0.354E 04	0.754E 02	178.27	184.55
113	228.17	220.67	530.82	529.15	0.337E 04	0.754E 02	178.27	184.91
114	216.97	209.17	531.07	529.05	0.332E 04	0.716E 02	178.17	185.51
115	216.97	209.67	531.07	529.05	0.311E 04	0.716E 02	178.17	186.05
116	206.67	199.37	531.17	529.22	0.296E 04	0.683E 02	178.09	185.29
117	207.17	199.77	531.17	529.22	0.301E 04	0.683E 02	178.10	185.21
118	195.27	188.37	531.48	529.01	0.265E 04	0.645E 02	177.98	187.19
119	195.27	188.57	531.48	529.01	0.257E 04	0.645E 02	177.98	187.49
120	182.27	175.17	531.34	529.29	0.254E 04	0.596E 02	177.86	184.69
121	168.27	161.37	531.83	529.81	0.227E 04	0.549E 02	177.84	184.17
122	168.17	161.37	531.83	529.81	0.224E 04	0.549E 02	177.84	184.27
123	155.26	149.26	531.55	529.68	0.183E 04	0.503E 02	177.66	183.90
124	155.16	148.76	531.55	529.68	0.195E 04	0.500E 02	177.65	183.48
125	141.46	135.76	531.80	529.68	0.158E 04	0.463E 02	177.55	184.31
126	141.26	135.46	531.80	529.68	0.161E 04	0.463E 02	177.54	184.17
127	129.56	123.66	531.87	529.99	0.149E 04	0.419E 02	177.47	182.70
128	129.56	123.66	531.87	529.99	0.149E 04	0.419E 02	177.47	182.70
129	120.76	115.66	532.07	530.20	0.121E 04	0.391E 02	177.44	183.08
130	120.96	115.21	532.07	530.20	0.133E 04	0.391E 02	177.44	182.51

TABLE 5 EXPERIMENTAL GAS FLOW DATA FOR CORE 1 (CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
132	112.26	107.06	532.00	530.30	0.114E 04	0.363E 02	177.36	181.98
133	98.78	93.78	532.11	530.41	0.963E 03	0.317E 02	177.25	181.45
134	98.28	93.68	532.11	530.41	0.883E 03	0.317E 02	177.25	181.81
135	89.76	85.06	532.04	530.86	0.822E 03	0.285E 02	177.21	180.00
136	89.26	84.46	532.04	530.86	0.834E 03	0.282E 02	177.21	179.91
137	77.96	73.16	532.18	530.75	0.725E 03	0.247E 02	177.10	179.94
138	78.26	73.26	532.18	530.75	0.758E 03	0.251E 02	177.10	179.83
139	67.66	63.16	532.21	531.00	0.589E 03	0.215E 02	177.04	179.26
140	67.66	63.16	532.21	531.00	0.589E 03	0.215E 02	177.04	179.26
141	58.16	53.26	532.21	530.82	0.546E 03	0.179E 02	176.92	178.90
142	58.26	53.06	532.21	530.82	0.579E 03	0.179E 02	176.92	178.79
143	47.26	43.36	532.28	531.10	0.353E 03	0.144E 02	176.87	178.58
148	26.19	22.36	532.49	531.62	0.186E 03	0.669E 01	176.76	177.45
149	25.76	22.36	532.49	531.62	0.164E 03	0.666E 01	176.76	177.52
152	21.75	18.86	532.39	531.94	0.117E 03	0.488E 01	176.75	177.14
153	21.63	18.76	532.39	531.94	0.116E 03	0.486E 01	176.75	177.14
154	21.63	18.67	532.39	531.94	0.119E 03	0.486E 01	176.75	177.13
155	19.84	17.35	532.53	532.04	0.926E 02	0.397E 01	176.77	177.21
156	19.88	17.20	532.53	532.04	0.992E 02	0.397E 01	176.77	177.18
157	17.80	15.80	532.46	532.25	0.673E 02	0.285E 01	176.77	176.98
158	17.74	15.75	532.46	532.25	0.666E 02	0.285E 01	176.77	176.98
159	15.98	14.65	532.70	532.46	0.405E 02	0.181E 01	176.81	177.15
160	15.95	14.58	532.70	532.46	0.417E 02	0.181E 01	176.81	177.14
161	16.03	14.68	532.70	532.46	0.415E 02	0.171E 01	176.81	177.15

TABLE 6 APPARENT GAS PERMEABILITY RESULTS FOR CORE 1

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
1	0.99978	0.8658E 03	0.3891E 03	0.06125	0.3891E 03	0.3886E 03
2	0.99978	0.8657E 03	0.3893E 03	0.06124	0.3893E 03	0.3888E 03
3	0.99978	0.8096E 03	0.3902E 03	0.06232	0.3902E 03	0.3897E 03
4	0.99978	0.8094E 03	0.3881E 03	0.06231	0.3881E 03	0.3876E 03
5	0.99978	0.7477E 03	0.3897E 03	0.06338	0.3897E 03	0.3894E 03
6	0.99979	0.6810E 03	0.3935E 03	0.06453	0.3935E 03	0.3930E 03
7	0.99979	0.6808E 03	0.3935E 03	0.06451	0.3935E 03	0.3931E 03
8	0.99979	0.5875E 03	0.3931E 03	0.06599	0.3931E 03	0.3925E 03
9	0.99979	0.5875E 03	0.3932E 03	0.06599	0.3932E 03	0.3926E 03
10	0.99980	0.5082E 03	0.3942E 03	0.06727	0.3942E 03	0.3935E 03
11	0.99980	0.5083E 03	0.3965E 03	0.06728	0.3965E 03	0.3958E 03
12	0.99980	0.5083E 03	0.3963E 03	0.06728	0.3964E 03	0.3957E 03
13	0.99980	0.4136E 03	0.3983E 03	0.06869	0.3983E 03	0.3976E 03
14	0.99980	0.4136E 03	0.3982E 03	0.06868	0.3982E 03	0.3976E 03
15	0.99980	0.3264E 03	0.4033E 03	0.06991	0.4033E 03	0.4021E 03
16	0.99980	0.3264E 03	0.4031E 03	0.06991	0.4031E 03	0.4019E 03
17	0.99981	0.2295E 03	0.4042E 03	0.07119	0.4042E 03	0.4030E 03
18	0.99981	0.2295E 03	0.4042E 03	0.07119	0.4042E 03	0.4030E 03
19	0.99981	0.1267E 03	0.4119E 03	0.07243	0.4119E 03	0.4087E 03
20	0.99983	0.1331E 03	0.4122E 03	0.07246	0.4122E 03	0.4088E 03
21	0.99983	0.8496E 02	0.4339E 03	0.07213	0.4339E 03	0.4257E 03
22	0.99983	0.5366E 02	0.4187E 03	0.07196	0.4187E 03	0.4089E 03
25	0.99983	0.2462E 03	0.4107E 03	0.07122	0.4107E 03	0.4091E 03
26	0.99983	0.2157E 03	0.4111E 03	0.07105	0.4111E 03	0.4081E 03
27	0.99983	0.1917E 03	0.4188E 03	0.07088	0.4188E 03	0.4156E 03
28	0.99983	0.1601E 03	0.4160E 03	0.07068	0.4160E 03	0.4122E 03
29	0.99983	0.1274E 03	0.4198E 03	0.07047	0.4198E 03	0.4155E 03
30	0.99983	0.1024E 03	0.4232E 03	0.07033	0.4232E 03	0.4165E 03
31	0.99982	0.5882E 02	0.4335E 03	0.07007	0.4335E 03	0.4215E 03
32	0.99982	0.1960E 02	0.4392E 03	0.06985	0.4392E 03	0.4012E 03
34	0.99980	0.3155E 03	0.4057E 03	0.06964	0.4057E 03	0.4044E 03
35	0.99980	0.2887E 03	0.4080E 03	0.06947	0.4080E 03	0.4063E 03
36	0.99980	0.2507E 03	0.3887E 03	0.06933	0.3887E 03	0.3870E 03
37	0.99980	0.2196E 03	0.4131E 03	0.06906	0.4131E 03	0.4109E 03
38	0.99980	0.1834E 03	0.4148E 03	0.06884	0.4148E 03	0.4112E 03
39	0.99980	0.1411E 03	0.4181E 03	0.06859	0.4181E 03	0.4137E 03
40	0.99980	0.9121E 02	0.4337E 03	0.06829	0.4337E 03	0.4257E 03
41	0.99980	0.4456E 02	0.4388E 03	0.06804	0.4389E 03	0.4252E 03
43	0.99982	0.1319E 03	0.4141E 03	0.07224	0.4141E 03	0.4097E 03
44	0.99982	0.7149E 02	0.4442E 03	0.07183	0.4442E 03	0.4376E 03

TABLE 6 APPARENT GAS PERMEABILITY RESULTS FOR CORE 1
(CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
45	0.99982	0.4022E 02	0.4505E 03	0.07166	0.4505E 03	0.4354E 03
47	0.99982	0.2461E 03	0.4118E 03	0.07104	0.4118E 03	0.4097E 03
48	0.99982	0.1884E 03	0.4137E 03	0.07072	0.4137E 03	0.4108E 03
49	0.99982	0.1197E 03	0.4147E 03	0.07028	0.4147E 03	0.4097E 03
50	0.99982	0.5878E 02	0.4342E 03	0.06991	0.4342E 03	0.4243E 03
52	0.99983	0.3368E 03	0.3997E 03	0.06986	0.3997E 03	0.3990E 03
53	0.99983	0.2750E 03	0.4066E 03	0.06946	0.4066E 03	0.4055E 03
54	0.99983	0.2123E 03	0.4070E 03	0.06908	0.4070E 03	0.4053E 03
55	0.99982	0.1411E 03	0.4153E 03	0.06865	0.4153E 03	0.4139E 03
56	0.99982	0.7639E 02	0.4262E 03	0.06827	0.4262E 03	0.4227E 03
58	0.99983	0.4255E 03	0.3969E 03	0.06863	0.3969E 03	0.3960E 03
59	0.99983	0.3653E 03	0.4035E 03	0.06826	0.4035E 03	0.4026E 03
60	0.99982	0.2918E 03	0.4064E 03	0.06782	0.4064E 03	0.4050E 03
61	0.99982	0.2059E 03	0.4086E 03	0.06733	0.4086E 03	0.4065E 03
62	0.99982	0.1273E 03	0.4160E 03	0.06690	0.4160E 03	0.4125E 03
63	0.99982	0.5901E 02	0.4372E 03	0.06652	0.4372E 03	0.4312E 03
65	0.99981	0.3829E 03	0.3821E 03	0.06849	0.3821E 03	0.3813E 03
66	0.99981	0.3820E 03	0.4079E 03	0.06834	0.4079E 03	0.4066E 03
67	0.99980	0.4242E 03	0.4141E 03	0.06772	0.4141E 03	0.4121E 03
68	0.99980	0.4743E 03	0.4049E 03	0.06697	0.4049E 03	0.4039E 03
69	0.99980	0.5174E 03	0.4053E 03	0.06627	0.4054E 03	0.4045E 03
70	0.99980	0.5569E 03	0.4028E 03	0.06563	0.4028E 03	0.4021E 03
71	0.99980	0.6021E 03	0.3988E 03	0.06486	0.3988E 03	0.3981E 03
72	0.99980	0.6458E 03	0.4009E 03	0.06419	0.4009E 03	0.4004E 03
73	0.99980	0.6805E 03	0.3991E 03	0.06363	0.3991E 03	0.3987E 03
74	0.99980	0.7132E 03	0.3970E 03	0.06317	0.3970E 03	0.3965E 03
75	0.99979	0.7531E 03	0.3979E 03	0.06247	0.3979E 03	0.3976E 03
76	0.99979	0.7860E 03	0.3960E 03	0.06187	0.3960E 03	0.3959E 03
77	0.99979	0.8236E 03	0.4051E 03	0.06109	0.4051E 03	0.4048E 03
78	0.99979	0.8587E 03	0.3836E 03	0.06072	0.3836E 03	0.3828E 03
79	0.99979	0.8930E 03	0.3815E 03	0.06000	0.3815E 03	0.3814E 03
80	0.99979	0.9396E 03	0.4014E 03	0.06000	0.4014E 03	0.4013E 03
81	0.99979	0.1140E 04	0.3824E 03	0.05781	0.3824E 03	0.3822E 03
82	0.99978	0.1265E 04	0.3726E 03	0.05508	0.3726E 03	0.3726E 03
83	0.99977	0.1365E 04	0.3669E 03	0.05263	0.3669E 03	0.3668E 03
84	0.99976	0.1455E 04	0.3721E 03	0.05034	0.3721E 03	0.3723E 03
85	0.99974	0.1529E 04	0.3843E 03	0.04785	0.3843E 03	0.3843E 03
86	0.99973	0.1580E 04	0.3785E 03	0.04595	0.3785E 03	0.3788E 03
87	0.99972	0.1645E 04	0.3619E 03	0.04418	0.3620E 03	0.3623E 03
88	0.99971	0.1691E 04	0.3593E 03	0.04245	0.3593E 03	0.3596E 03

TABLE 6 APPARENT GAS PERMEABILITY RESULTS FOR CORE 1
(CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
89	0.99970	0.1740E 04	0.3590E 03	0.04072	0.3590E 03	0.3594E 03
90	0.99969	0.1771E 04	0.3687E 03	0.03909	0.3687E 03	0.3694E 03
91	0.99968	0.1808E 04	0.3666E 03	0.03779	0.3666E 03	0.3672E 03
92	0.99967	0.1852E 04	0.3521E 03	0.03653	0.3521E 03	0.3528E 03
93	0.99966	0.1876E 04	0.3512E 03	0.03527	0.3512E 03	0.3518E 03
94	0.99965	0.1905E 04	0.3640E 03	0.03396	0.3640E 03	0.3646E 03
95	0.99962	0.1959E 04	0.3517E 03	0.03186	0.3517E 03	0.3525E 03
97	0.99958	0.2029E 04	0.3443E 03	0.02830	0.3443E 03	0.3452E 03
98	0.99955	0.2056E 04	0.3393E 03	0.02675	0.3393E 03	0.3402E 03
99	0.99955	0.2049E 04	0.3243E 03	0.02665	0.3243E 03	0.3251E 03
100	0.99953	0.2072E 04	0.3267E 03	0.02525	0.3267E 03	0.3275E 03
101	0.99951	0.2089E 04	0.3263E 03	0.02417	0.3263E 03	0.3273E 03
102	0.99948	0.2095E 04	0.3216E 03	0.02298	0.3216E 03	0.3227E 03
103	0.99944	0.2100E 04	0.3442E 03	0.02118	0.3442E 03	0.3455E 03
104	0.99939	0.2103E 04	0.3366E 03	0.01936	0.3366E 03	0.3380E 03
105	0.99939	0.2093E 04	0.3349E 03	0.01936	0.3350E 03	0.3364E 03
106	0.99920	0.1823E 04	0.3473E 03	0.01451	0.3473E 03	0.3497E 03
107	0.99911	0.1832E 04	0.3331E 03	0.01295	0.3332E 03	0.3355E 03
108	0.99675	0.1707E 04	0.1940E 03	0.00409	0.1942E 03	0.1981E 03
109	0.99674	0.1700E 04	0.1954E 03	0.00407	0.1956E 03	0.1996E 03
110	0.99688	0.1696E 04	0.2147E 03	0.00429	0.2149E 03	0.2214E 03
112	0.99698	0.1697E 04	0.2148E 03	0.00446	0.2151E 03	0.2227E 03
113	0.99698	0.1694E 04	0.2259E 03	0.00446	0.2262E 03	0.2345E 03
114	0.99711	0.1695E 04	0.2173E 03	0.00469	0.2176E 03	0.2265E 03
115	0.99711	0.1693E 04	0.2319E 03	0.00469	0.2322E 03	0.2425E 03
116	0.99723	0.1695E 04	0.2322E 03	0.00493	0.2325E 03	0.2419E 03
117	0.99723	0.1692E 04	0.2286E 03	0.00491	0.2289E 03	0.2380E 03
118	0.99737	0.1693E 04	0.2454E 03	0.00521	0.2458E 03	0.2585E 03
119	0.99737	0.1692E 04	0.2526E 03	0.00521	0.2530E 03	0.2665E 03
120	0.99753	0.1678E 04	0.2364E 03	0.00560	0.2366E 03	0.2457E 03
121	0.99772	0.1679E 04	0.2433E 03	0.00607	0.2435E 03	0.2522E 03
122	0.99772	0.1679E 04	0.2470E 03	0.00607	0.2472E 03	0.2561E 03
123	0.99787	0.1664E 04	0.2773E 03	0.00657	0.2776E 03	0.2873E 03
124	0.99787	0.1657E 04	0.2589E 03	0.00658	0.2591E 03	0.2676E 03
125	0.99804	0.1681E 04	0.2950E 03	0.00721	0.2952E 03	0.3064E 03
126	0.99805	0.1684E 04	0.2904E 03	0.00723	0.2906E 03	0.3015E 03
127	0.99821	0.1668E 04	0.2827E 03	0.00790	0.2829E 03	0.2912E 03
128	0.99821	0.1668E 04	0.2827E 03	0.00790	0.2829E 03	0.2912E 03
129	0.99832	0.1668E 04	0.3270E 03	0.00846	0.3272E 03	0.3376E 03
130	0.99832	0.1670E 04	0.2956E 03	0.00847	0.2957E 03	0.3042E 03

TABLE 6 APPARENT GAS PERMEABILITY RESULTS FOR CORE 1 (CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
132	0.99843	0.1668E 04	0.3208E 03	0.00912	0.3209E 03	0.3293E 03
133	0.99862	0.1656E 04	0.3311E 03	0.01039	0.3313E 03	0.3391E 03
134	0.99862	0.1661E 04	0.3611E 03	0.01042	0.3612E 03	0.3705E 03
135	0.99874	0.1640E 04	0.3490E 03	0.01144	0.3491E 03	0.3546E 03
136	0.99875	0.1633E 04	0.3401E 03	0.01151	0.3402E 03	0.3454E 03
137	0.99890	0.1645E 04	0.3426E 03	0.01323	0.3427E 03	0.3482E 03
138	0.99890	0.1665E 04	0.3330E 03	0.01320	0.3331E 03	0.3382E 03
139	0.99905	0.1655E 04	0.3677E 03	0.01529	0.3678E 03	0.3724E 03
140	0.99905	0.1655E 04	0.3677E 03	0.01529	0.3678E 03	0.3724E 03
141	0.99918	0.1619E 04	0.3303E 03	0.01795	0.3304E 03	0.3341E 03
142	0.99918	0.1613E 04	0.3102E 03	0.01797	0.3103E 03	0.3135E 03
143	0.99933	0.1603E 04	0.4109E 03	0.02207	0.4109E 03	0.4149E 03
148	0.99964	0.1386E 04	0.3615E 03	0.04120	0.3615E 03	0.3629E 03
149	0.99964	0.1394E 04	0.4095E 03	0.04156	0.4095E 03	0.4112E 03
152	0.99970	0.1210E 04	0.4188E 03	0.04926	0.4188E 03	0.4197E 03
153	0.99970	0.1210E 04	0.4208E 03	0.04952	0.4208E 03	0.4217E 03
154	0.99970	0.1213E 04	0.4092E 03	0.04962	0.4092E 03	0.4101E 03
155	0.99973	0.1076E 04	0.4319E 03	0.05377	0.4319E 03	0.4330E 03
156	0.99973	0.1079E 04	0.4034E 03	0.05394	0.4034E 03	0.4043E 03
157	0.99975	0.8555E 03	0.4275E 03	0.05951	0.4275E 03	0.4281E 03
158	0.99975	0.8588E 03	0.4314E 03	0.05973	0.4314E 03	0.4320E 03
159	0.99977	0.5966E 03	0.4513E 03	0.06530	0.4513E 03	0.4521E 03
160	0.99978	0.5985E 03	0.4386E 03	0.06551	0.4386E 03	0.4395E 03
161	0.99977	0.5617E 03	0.4161E 03	0.06511	0.4162E 03	0.4169E 03

TABLE 7 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 1

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
1	0.24194E 12	0.71611E 02	0.24194E 12	0.24225E 12	0.71702E 02
2	0.24183E 12	0.71611E 02	0.24183E 12	0.24214E 12	0.71702E 02
3	0.24125E 12	0.65815E 02	0.24125E 12	0.24157E 12	0.65903E 02
4	0.24254E 12	0.65815E 02	0.24254E 12	0.24286E 12	0.65903E 02
5	0.24156E 12	0.59733E 02	0.24156E 12	0.24176E 12	0.59782E 02
6	0.23923E 12	0.53438E 02	0.23923E 12	0.23950E 12	0.53498E 02
7	0.23920E 12	0.53438E 02	0.23920E 12	0.23946E 12	0.53498E 02
8	0.23945E 12	0.45047E 02	0.23945E 12	0.23981E 12	0.45115E 02
9	0.23939E 12	0.45047E 02	0.23939E 12	0.23975E 12	0.45115E 02
10	0.23881E 12	0.38223E 02	0.23881E 12	0.23922E 12	0.38289E 02
11	0.23743E 12	0.38223E 02	0.23743E 12	0.23784E 12	0.38289E 02
12	0.23750E 12	0.38223E 02	0.23750E 12	0.23791E 12	0.38289E 02
13	0.23636E 12	0.30471E 02	0.23636E 12	0.23677E 12	0.30524E 02
14	0.23637E 12	0.30471E 02	0.23637E 12	0.23678E 12	0.30524E 02
15	0.23342E 12	0.23624E 02	0.23342E 12	0.23413E 12	0.23696E 02
16	0.23353E 12	0.23624E 02	0.23353E 12	0.23424E 12	0.23696E 02
17	0.23288E 12	0.16301E 02	0.23288E 12	0.23360E 12	0.16351E 02
18	0.23288E 12	0.16301E 02	0.23288E 12	0.23360E 12	0.16351E 02
19	0.22855E 12	0.88486E 01	0.22855E 12	0.23032E 12	0.89172E 01
20	0.22836E 12	0.91453E 01	0.22837E 12	0.23030E 12	0.92227E 01
21	0.21697E 12	0.58609E 01	0.21697E 12	0.22113E 12	0.59732E 01
22	0.22481E 12	0.37095E 01	0.22481E 12	0.23023E 12	0.37990E 01
25	0.22919E 12	0.17166E 02	0.22919E 12	0.23013E 12	0.17236E 02
26	0.22900E 12	0.15075E 02	0.22900E 12	0.23066E 12	0.15184E 02
27	0.22479E 12	0.13422E 02	0.22479E 12	0.22550E 12	0.13524E 02
28	0.22630E 12	0.11236E 02	0.22630E 12	0.22835E 12	0.11338E 02
29	0.22423E 12	0.89636E 01	0.22423E 12	0.22656E 12	0.90568E 01
30	0.22244E 12	0.72161E 01	0.22245E 12	0.22599E 12	0.73310E 01
31	0.21717E 12	0.41608E 01	0.21717E 12	0.22336E 12	0.42794E 01
32	0.21434E 12	0.13907E 01	0.21435E 12	0.23464E 12	0.15223E 01
34	0.23203E 12	0.22947E 02	0.23203E 12	0.23277E 12	0.23020E 02
35	0.23074E 12	0.21030E 02	0.23074E 12	0.23167E 12	0.21114E 02
36	0.24218E 12	0.18280E 02	0.24218E 12	0.24324E 12	0.18360E 02
37	0.22788E 12	0.16063E 02	0.22788E 12	0.22910E 12	0.16149E 02
38	0.22694E 12	0.13452E 02	0.22694E 12	0.22895E 12	0.13571E 02
39	0.22514E 12	0.10376E 02	0.22513E 12	0.22753E 12	0.10486E 02
40	0.21706E 12	0.67322E 01	0.21705E 12	0.22113E 12	0.68588E 01
41	0.21450E 12	0.32991E 01	0.21450E 12	0.22138E 12	0.34049E 01
43	0.22732E 12	0.91313E 01	0.22732E 12	0.22975E 12	0.92290E 01
44	0.21191E 12	0.49745E 01	0.21191E 12	0.21510E 12	0.50493E 01

TABLE 7 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 1 (CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
45	0.20895E 12	0.28039E 01	0.20895E 12	0.21620E 12	0.29013E 01
47	0.22860E 12	0.17282E 02	0.22860E 12	0.22979E 12	0.17373E 02
48	0.22756E 12	0.13285E 02	0.22756E 12	0.22913E 12	0.13376E 02
49	0.22698E 12	0.84926E 01	0.22699E 12	0.22974E 12	0.85957E 01
50	0.21678E 12	0.41899E 01	0.21678E 12	0.22187E 12	0.42832E 01
52	0.23553E 12	0.23814E 02	0.23554E 12	0.23594E 12	0.23855E 02
53	0.23153E 12	0.19548E 02	0.23153E 12	0.23215E 12	0.19601E 02
54	0.23128E 12	0.15173E 02	0.23128E 12	0.23224E 12	0.15236E 02
55	0.22668E 12	0.10145E 02	0.22668E 12	0.22743E 12	0.10178E 02
56	0.22086E 12	0.55220E 01	0.22087E 12	0.22270E 12	0.55680E 01
58	0.23718E 12	0.30577E 02	0.23718E 12	0.23774E 12	0.30650E 02
59	0.23327E 12	0.26378E 02	0.23327E 12	0.23384E 12	0.26442E 02
60	0.23161E 12	0.21197E 02	0.23161E 12	0.23244E 12	0.21273E 02
61	0.23039E 12	0.15062E 02	0.23039E 12	0.23158E 12	0.15140E 02
62	0.22626E 12	0.93704E 01	0.22626E 12	0.22819E 12	0.94503E 01
63	0.21530E 12	0.43669E 01	0.21530E 12	0.21833E 12	0.44283E 01
65	0.24634E 12	0.28140E 02	0.24634E 12	0.24688E 12	0.28201E 02
66	0.23080E 12	0.28141E 02	0.23080E 12	0.23151E 12	0.28228E 02
67	0.22733E 12	0.31492E 02	0.22733E 12	0.22845E 12	0.31648E 02
68	0.23247E 12	0.35568E 02	0.23247E 12	0.23306E 12	0.35658E 02
69	0.23223E 12	0.39167E 02	0.23223E 12	0.23270E 12	0.39248E 02
70	0.23368E 12	0.42534E 02	0.23368E 12	0.23413E 12	0.42615E 02
71	0.23604E 12	0.46510E 02	0.23604E 12	0.23646E 12	0.46592E 02
72	0.23480E 12	0.50369E 02	0.23480E 12	0.23508E 12	0.50429E 02
73	0.23585E 12	0.53513E 02	0.23585E 12	0.23612E 12	0.53574E 02
74	0.23712E 12	0.56464E 02	0.23712E 12	0.23743E 12	0.56538E 02
75	0.23657E 12	0.60257E 02	0.23658E 12	0.23673E 12	0.60296E 02
76	0.23769E 12	0.63456E 02	0.23769E 12	0.23779E 12	0.63483E 02
77	0.23236E 12	0.67318E 02	0.23236E 12	0.23255E 12	0.67373E 02
78	0.24539E 12	0.70492E 02	0.24539E 12	0.24588E 12	0.70633E 02
79	0.24676E 12	0.74217E 02	0.24676E 12	0.24681E 12	0.74232E 02
80	0.23454E 12	0.78083E 02	0.23454E 12	0.23459E 12	0.78098E 02
81	0.24619E 12	0.97790E 02	0.24619E 12	0.24627E 12	0.97819E 02
82	0.25262E 12	0.11394E 03	0.25262E 12	0.25266E 12	0.11396E 03
83	0.25658E 12	0.12873E 03	0.25658E 12	0.25662E 12	0.12875E 03
84	0.25296E 12	0.14331E 03	0.25296E 12	0.25287E 12	0.14326E 03
85	0.24498E 12	0.15831E 03	0.24498E 12	0.24495E 12	0.15830E 03
86	0.24869E 12	0.17032E 03	0.24868E 12	0.24853E 12	0.17022E 03
87	0.26008E 12	0.18439E 03	0.26007E 12	0.25983E 12	0.18421E 03
88	0.26198E 12	0.19722E 03	0.26198E 12	0.26176E 12	0.19706E 03

TABLE 7 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 1 (CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
89	0.26220E 12	0.21157E 03	0.26219E 12	0.26194E 12	0.21136E 03
90	0.25529E 12	0.22422E 03	0.25529E 12	0.25486E 12	0.22385E 03
91	0.25676E 12	0.23664E 03	0.25675E 12	0.25639E 12	0.23631E 03
92	0.26733E 12	0.25068E 03	0.26733E 12	0.26679E 12	0.25017E 03
93	0.26801E 12	0.26294E 03	0.26800E 12	0.26759E 12	0.26254E 03
94	0.25863E 12	0.27716E 03	0.25862E 12	0.25817E 12	0.27667E 03
95	0.26766E 12	0.30371E 03	0.26766E 12	0.26704E 12	0.30301E 03
97	0.27338E 12	0.35409E 03	0.27338E 12	0.27270E 12	0.35322E 03
98	0.27744E 12	0.37948E 03	0.27743E 12	0.27669E 12	0.37846E 03
99	0.29031E 12	0.37948E 03	0.29030E 12	0.28955E 12	0.37850E 03
100	0.28815E 12	0.40487E 03	0.28815E 12	0.28745E 12	0.40389E 03
101	0.28846E 12	0.42656E 03	0.28845E 12	0.28759E 12	0.42530E 03
102	0.29272E 12	0.44975E 03	0.29271E 12	0.29167E 12	0.44815E 03
103	0.27347E 12	0.48891E 03	0.27347E 12	0.27250E 12	0.48718E 03
104	0.27970E 12	0.53538E 03	0.27969E 12	0.27851E 12	0.53313E 03
105	0.28105E 12	0.53280E 03	0.28104E 12	0.27986E 12	0.53056E 03
106	0.27103E 12	0.61798E 03	0.27102E 12	0.26921E 12	0.61387E 03
107	0.28258E 12	0.69537E 03	0.28255E 12	0.28054E 12	0.69042E 03
108	0.48527E 12	0.21203E 04	0.48473E 12	0.47512E 12	0.20783E 04
109	0.48179E 12	0.21201E 04	0.48124E 12	0.47155E 12	0.20775E 04
110	0.43854E 12	0.20086E 04	0.43803E 12	0.42511E 12	0.19494E 04
112	0.43815E 12	0.19351E 04	0.43759E 12	0.42270E 12	0.18692E 04
113	0.41670E 12	0.19350E 04	0.41613E 12	0.40120E 12	0.18655E 04
114	0.43326E 12	0.18393E 04	0.43265E 12	0.41553E 12	0.17665E 04
115	0.40596E 12	0.18393E 04	0.40535E 12	0.38819E 12	0.17614E 04
116	0.40533E 12	0.17540E 04	0.40480E 12	0.38907E 12	0.16859E 04
117	0.41179E 12	0.17540E 04	0.41125E 12	0.39545E 12	0.16866E 04
118	0.38363E 12	0.16567E 04	0.38303E 12	0.36418E 12	0.15752E 04
119	0.37270E 12	0.16567E 04	0.37210E 12	0.35323E 12	0.15727E 04
120	0.39822E 12	0.15318E 04	0.39778E 12	0.38309E 12	0.14752E 04
121	0.38669E 12	0.14117E 04	0.38653E 12	0.37324E 12	0.13632E 04
122	0.38117E 12	0.14117E 04	0.38081E 12	0.36753E 12	0.13625E 04
123	0.33942E 12	0.12957E 04	0.33913E 12	0.32752E 12	0.12517E 04
124	0.36354E 12	0.12879E 04	0.36325E 12	0.35171E 12	0.12470E 04
125	0.31915E 12	0.11928E 04	0.31888E 12	0.30719E 12	0.11490E 04
126	0.32416E 12	0.11928E 04	0.32390E 12	0.31225E 12	0.11499E 04
127	0.33299E 12	0.10812E 04	0.33279E 12	0.32328E 12	0.10503E 04
128	0.33299E 12	0.10812E 04	0.33279E 12	0.32328E 12	0.10503E 04
129	0.28789E 12	0.10091E 04	0.28772E 12	0.27885E 12	0.97802E 03
130	0.31847E 12	0.10091E 04	0.31830E 12	0.30946E 12	0.98110E 03

TABLE 7 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 1 (CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
132	0.29347E 12	0.93709E 03	0.29334E 12	0.28588E 12	0.91328E 03
133	0.28427E 12	0.81738E 03	0.28417E 12	0.27759E 12	0.79846E 03
134	0.26071E 12	0.81739E 03	0.26061E 12	0.25408E 12	0.79690E 03
135	0.26972E 12	0.73514E 03	0.26966E 12	0.26549E 12	0.72377E 03
136	0.27677E 12	0.72708E 03	0.27672E 12	0.27255E 12	0.71614E 03
137	0.27474E 12	0.63781E 03	0.27469E 12	0.27035E 12	0.62775E 03
138	0.28269E 12	0.64740E 03	0.28264E 12	0.27835E 12	0.63758E 03
139	0.25600E 12	0.55569E 03	0.25597E 12	0.25279E 12	0.54681E 03
140	0.25598E 12	0.55573E 03	0.25595E 12	0.25278E 12	0.54885E 03
141	0.28497E 12	0.46355E 03	0.28495E 12	0.28179E 12	0.45842E 03
142	0.30343E 12	0.46160E 03	0.30341E 12	0.30024E 12	0.45678E 03
143	0.22908E 12	0.37334E 03	0.22907E 12	0.22687E 12	0.36976E 03
148	0.26039E 12	0.17303E 03	0.26039E 12	0.25939E 12	0.17237E 03
149	0.22990E 12	0.17245E 03	0.22990E 12	0.22891E 12	0.17171E 03
152	0.22477E 12	0.12627E 03	0.22477E 12	0.22427E 12	0.12599E 03
153	0.22371E 12	0.12566E 03	0.22371E 12	0.22322E 12	0.12538E 03
154	0.23006E 12	0.12566E 03	0.23006E 12	0.22956E 12	0.12539E 03
155	0.21793E 12	0.10283E 03	0.21793E 12	0.21738E 12	0.10257E 03
156	0.23336E 12	0.10283E 03	0.23336E 12	0.23282E 12	0.10259E 03
157	0.22018E 12	0.73879E 02	0.22018E 12	0.21991E 12	0.73790E 02
158	0.21819E 12	0.73879E 02	0.21819E 12	0.21793E 12	0.73790E 02
159	0.20860E 12	0.46905E 02	0.20860E 12	0.20820E 12	0.46814E 02
160	0.21460E 12	0.46905E 02	0.21460E 12	0.21420E 12	0.46817E 02
161	0.22620E 12	0.44296E 02	0.22620E 12	0.22577E 12	0.44211E 02

TABLE 8 EXPERIMENTAL GAS FLOW DATA FOR CORE 2

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
1	14.37	13.63	535.86	535.72	0.209E 02	0.278E-01	177.59	177.90
2	15.11	13.63	535.93	535.83	0.426E 02	0.555E-01	177.61	177.73
3	15.67	13.64	535.96	535.93	0.594E 02	0.801E-01	177.63	177.66
4	16.17	13.65	536.07	536.04	0.752E 02	0.954E-01	177.66	177.68
5	16.67	13.65	536.21	536.11	0.915E 02	0.114E 00	177.69	177.75
6	17.17	13.65	536.27	536.21	0.109E 03	0.132E 00	177.71	177.75
7	17.69	13.66	536.34	536.28	0.126E 03	0.150E 00	177.73	177.77
8	18.19	13.66	536.45	536.38	0.144E 03	0.175E 00	177.76	177.79
9	18.69	13.67	536.52	536.45	0.162E 03	0.190E 00	177.78	177.81
10	19.17	13.68	536.55	536.52	0.181E 03	0.211E 00	177.80	177.81
11	19.71	13.69	536.55	536.56	0.201E 03	0.235E 00	177.80	177.80
12	20.21	13.69	536.59	536.63	0.221E 03	0.260E 00	177.82	177.81
13	20.71	13.70	536.66	536.73	0.241E 03	0.278E 00	177.84	177.82
14	21.20	13.71	536.69	536.77	0.262E 03	0.302E 00	177.85	177.83
15	21.70	13.71	536.73	536.77	0.283E 03	0.326E 00	177.86	177.85
16	22.24	13.72	536.79	537.01	0.306E 03	0.353E 00	177.90	177.85
17	22.73	13.73	536.86	536.83	0.328E 03	0.371E 00	177.89	177.90
18	23.24	13.74	536.90	536.87	0.351E 03	0.395E 00	177.90	177.91
19	23.75	13.75	536.90	536.90	0.375E 03	0.422E 00	177.91	177.91
20	24.24	13.76	536.97	536.97	0.398E 03	0.445E 00	177.93	177.93
21	24.76	13.77	537.00	537.01	0.423E 03	0.475E 00	177.94	177.94
22	25.26	13.78	537.04	537.04	0.448E 03	0.500E 00	177.95	177.96
23	25.76	13.80	537.04	537.08	0.473E 03	0.526E 00	177.96	177.96
24	26.25	13.81	537.11	537.15	0.499E 03	0.550E 00	177.98	177.98
25	26.79	13.82	537.18	537.18	0.527E 03	0.580E 00	177.99	178.00
26	27.29	13.83	537.21	537.22	0.553E 03	0.606E 00	178.00	178.01
27	27.80	13.84	537.21	537.25	0.581E 03	0.636E 00	178.01	178.01
28	28.30	13.86	537.25	537.29	0.609E 03	0.659E 00	178.02	178.02
29	28.82	13.87	537.25	537.29	0.638E 03	0.689E 00	178.02	178.03
30	29.32	13.89	537.28	537.29	0.667E 03	0.721E 00	178.03	178.04
31	29.83	13.90	537.28	537.29	0.696E 03	0.753E 00	178.03	178.04
32	30.34	13.92	537.35	537.35	0.727E 03	0.783E 00	178.05	178.06
33	30.86	13.94	537.38	537.39	0.758E 03	0.815E 00	178.07	178.07
34	31.39	13.96	537.42	537.46	0.790E 03	0.844E 00	178.08	178.08
35	31.89	13.98	537.49	537.49	0.822E 03	0.873E 00	178.10	178.11
36	32.40	13.99	537.52	537.56	0.854E 03	0.893E 00	178.11	178.12
37	32.91	14.02	537.52	537.60	0.887E 03	0.939E 00	178.12	178.12
38	33.97	14.06	537.56	537.63	0.956E 03	0.101E 01	178.13	178.13
39	34.45	14.08	537.56	537.63	0.989E 03	0.104E 01	178.13	178.14
40	34.96	14.10	537.63	537.63	0.102E 04	0.107E 01	178.15	178.16

TABLE 8 EXPERIMENTAL GAS FLOW DATA FOR CORE 2 (CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
41	35.47	14.11	537.66	537.63	0.106E 04	0.110E 01	178.15	178.17
42	36.01	14.13	537.66	537.70	0.110E 04	0.114E 01	178.16	178.17
43	36.48	14.14	537.66	537.74	0.113E 04	0.117E 01	178.17	178.17
44	37.02	14.16	537.73	537.77	0.117E 04	0.121E 01	178.19	178.20
45	37.53	14.18	537.77	537.81	0.121E 04	0.125E 01	178.20	178.21
46	38.31	14.21	537.80	537.84	0.127E 04	0.129E 01	178.21	178.22
47	38.56	14.23	537.80	537.84	0.128E 04	0.132E 01	178.21	178.22
48	39.07	14.25	537.87	537.87	0.132E 04	0.136E 01	178.23	178.25
49	39.62	14.27	537.90	537.87	0.137E 04	0.139E 01	178.23	178.26
50	40.12	14.30	537.94	537.94	0.141E 04	0.143E 01	178.25	178.27
51	40.64	14.32	537.97	537.98	0.145E 04	0.147E 01	178.26	178.28
52	41.14	14.35	537.97	538.01	0.149E 04	0.151E 01	178.27	178.28
53	41.62	14.37	537.97	538.01	0.153E 04	0.154E 01	178.27	178.29
54	43.91	14.49	537.97	538.01	0.172E 04	0.171E 01	178.28	178.30
55	45.36	14.56	538.08	538.01	0.185E 04	0.180E 01	178.30	178.34
56	47.51	14.70	538.06	538.01	0.204E 04	0.198E 01	178.31	178.35
57	48.76	14.79	538.08	538.12	0.216E 04	0.210E 01	178.33	178.36
58	50.41	14.89	538.15	538.12	0.232E 04	0.224E 01	178.35	178.39
59	52.31	15.02	538.22	538.12	0.251E 04	0.240E 01	178.37	178.42
60	54.01	15.15	538.18	538.12	0.269E 04	0.256E 01	178.37	178.42
61	55.26	15.26	538.15	538.12	0.282E 04	0.267E 01	178.38	178.42
62	56.71	15.36	538.18	538.12	0.298E 04	0.281E 01	178.39	178.44
63	56.71	14.92	538.18	538.12	0.299E 04	0.288E 01	178.39	178.44
64	59.82	15.15	538.25	538.15	0.335E 04	0.316E 01	178.42	178.47
65	63.92	15.51	538.25	538.15	0.384E 04	0.357E 01	178.44	178.50
66	76.26	16.91	538.25	538.15	0.553E 04	0.490E 01	178.50	178.58
67	88.91	18.86	538.25	538.15	0.755E 04	0.641E 01	178.58	178.67
68	96.11	20.19	538.28	538.12	0.883E 04	0.730E 01	178.62	178.73
69	104.51	21.81	538.28	538.08	0.104E 05	0.839E 01	178.67	178.79
70	114.06	23.93	538.32	538.01	0.124E 05	0.970E 01	178.72	178.86
71	122.01	25.89	538.35	537.98	0.142E 05	0.108E 02	178.77	178.93
72	128.51	27.52	538.39	537.94	0.158E 05	0.118E 02	178.81	178.98
73	137.71	29.98	538.46	537.87	0.181E 05	0.131E 02	178.87	179.07
74	148.50	33.13	538.53	537.81	0.210E 05	0.147E 02	178.94	179.17
75	155.75	35.47	538.56	537.81	0.230E 05	0.159E 02	178.99	179.23
76	163.30	38.02	538.60	537.81	0.252E 05	0.171E 02	179.05	179.30
77	171.20	40.74	538.63	537.81	0.277E 05	0.184E 02	179.11	179.37
78	174.90	42.05	538.70	537.81	0.288E 05	0.190E 02	179.14	179.42
79	174.90	41.96	538.77	537.84	0.286E 05	0.185E 02	179.16	179.43
80	226.95	69.60	539.29	537.81	0.467E 05	0.271E 02	179.64	180.02

TABLE 8 EXPERIMENTAL GAS FLOW DATA FOR CORE 2
(CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
81	256.15	81.50	539.46	537.81	0.590E 05	0.314E 02	179.88	180.31
82	264.86	87.21	539.64	537.77	0.625E 05	0.332E 02	179.98	180.44
83	289.61	98.45	539.84	537.63	0.742E 05	0.371E 02	180.18	180.72
84	314.66	110.15	539.98	537.60	0.859E 05	0.423E 02	180.40	180.98
85	360.20	132.00	540.15	537.53	0.112E 06	0.506E 02	180.79	181.45
86	413.47	158.75	540.22	537.39	0.146E 06	0.606E 02	181.25	181.97
87	463.47	184.35	540.54	537.18	0.181E 06	0.708E 02	181.71	182.56
88	512.28	211.65	540.65	537.15	0.218E 06	0.806E 02	182.21	183.15
89	565.55	232.30	540.81	536.97	0.266E 06	0.890E 02	182.64	183.64
90	608.42	261.60	540.95	536.80	0.302E 06	0.100E 03	183.09	184.17
91	580.40	247.50	540.92	536.70	0.276E 06	0.942E 02	182.80	183.88
92	533.27	222.85	540.85	536.73	0.235E 06	0.844E 02	182.35	183.38
93	482.58	196.15	540.95	536.59	0.194E 06	0.745E 02	181.87	182.91
94	433.07	170.80	540.85	536.73	0.158E 06	0.645E 02	181.43	182.39
95	385.65	146.70	540.85	536.77	0.127E 06	0.550E 02	181.02	181.94
96	333.27	121.10	540.78	536.77	0.964E 05	0.455E 02	180.56	181.43
97	272.48	92.15	540.60	536.94	0.658E 05	0.340E 02	180.06	180.82
98	237.03	76.20	540.47	536.97	0.504E 05	0.282E 02	179.77	180.47
99	211.09	65.15	540.40	537.04	0.403E 05	0.242E 02	179.57	180.23
100	210.80	65.10	540.33	537.18	0.402E 05	0.243E 02	179.58	180.21
101	185.75	54.50	540.19	537.25	0.315E 05	0.201E 02	179.38	179.96
102	162.78	45.50	540.09	537.25	0.244E 05	0.166E 02	179.20	179.74
103	136.24	35.25	539.98	537.32	0.173E 05	0.127E 02	179.01	179.50
104	113.37	26.10	539.88	537.46	0.122E 05	0.958E 01	178.85	179.29
106	97.53	21.73	539.70	537.63	0.904E 04	0.752E 01	178.75	179.12
107	98.25	21.71	539.60	537.70	0.918E 04	0.754E 01	178.75	179.10
108	87.25	19.30	539.64	537.74	0.724E 04	0.615E 01	178.69	179.03
109	78.15	17.34	539.43	537.74	0.581E 04	0.511E 01	178.61	178.91
110	67.70	15.92	539.43	537.74	0.433E 04	0.395E 01	178.55	178.84
111	57.30	14.98	539.43	537.87	0.306E 04	0.290E 01	178.51	178.78
112	48.25	14.42	539.36	537.91	0.212E 04	0.205E 01	178.46	178.71
115	14.15	13.59	532.39	533.09	0.157E 02	0.218E-01	176.83	174.74
116	14.35	13.59	532.49	533.09	0.211E 02	0.280E-01	176.85	175.50
117	14.53	13.59	532.56	533.15	0.263E 02	0.311E-01	176.87	175.77
118	14.71	13.59	532.63	533.26	0.317E 02	0.404E-01	176.89	175.91
119	14.88	13.59	532.70	533.36	0.365E 02	0.497E-01	176.91	176.00
121	15.25	13.60	532.80	533.50	0.478E 02	0.590E-01	176.94	176.19
122	15.44	13.60	532.87	533.57	0.535E 02	0.652E-01	176.96	176.28
123	15.46	14.32	532.91	533.64	0.340E 02	0.435E-01	176.98	175.80
124	15.48	14.81	532.94	533.71	0.202E 02	0.249E-01	176.99	174.87

TABLE 8 EXPERIMENTAL GAS FLOW DATA FOR CORE 2 (CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
125	15.44	13.60	533.01	533.78	0.534E 02	0.652E-01	177.00	176.25
126	16.76	13.62	533.08	533.85	0.955E 02	0.118E 00	177.03	176.56
127	17.83	13.63	533.12	533.92	0.132E 03	0.158E 00	177.04	176.67
128	18.79	13.64	533.19	533.95	0.167E 03	0.201E 00	177.06	176.76
129	19.76	13.66	533.26	533.99	0.204E 03	0.241E 00	177.08	176.82
130	20.75	13.68	533.29	534.02	0.243E 03	0.283E 00	177.09	176.87
131	21.79	13.70	533.36	534.09	0.287E 03	0.332E 00	177.11	176.91
132	22.78	13.72	533.43	534.09	0.331E 03	0.378E 00	177.13	176.96
133	23.71	13.74	532.42	534.09	0.373E 03	0.423E 00	177.01	176.60
134	23.71	14.67	533.53	534.16	0.347E 03	0.396E 00	177.16	176.99
136	24.04	16.70	533.64	534.23	0.299E 03	0.329E 00	177.19	176.98
137	24.19	20.27	533.71	534.27	0.174E 03	0.188E 00	177.22	176.83
143	14.32	13.50	531.13	531.90	0.229E 02	0.311E-01	176.54	174.95
144	14.48	13.50	531.34	532.08	0.273E 02	0.372E-01	176.58	175.30
145	14.62	13.50	531.38	532.18	0.315E 02	0.434E-01	176.60	175.36
147	14.92	13.51	531.76	532.60	0.402E 02	0.557E-01	176.70	175.67
148	15.05	13.51	531.83	532.70	0.441E 02	0.588E-01	176.72	175.73
149	14.99	13.51	534.30	534.75	0.422E 02	0.553E-01	177.28	176.74
150	15.81	13.52	534.44	534.86	0.672E 02	0.890E-01	177.31	176.98
151	17.75	13.55	534.44	534.89	0.132E 03	0.168E 00	177.33	177.11
152	19.80	13.57	534.47	534.96	0.208E 03	0.238E 00	177.35	177.18
153	21.74	13.62	534.54	535.03	0.287E 03	0.338E 00	177.37	177.24
154	23.75	13.66	534.54	535.10	0.377E 03	0.422E 00	177.39	177.26
155	25.70	13.72	534.64	535.13	0.472E 03	0.535E 00	177.42	177.32
156	27.79	13.79	534.64	535.20	0.582E 03	0.651E 00	177.44	177.33
157	29.83	13.87	534.71	535.20	0.697E 03	0.771E 00	177.46	177.37
158	31.85	13.94	534.75	535.24	0.820E 03	0.882E 00	177.48	177.40
159	33.98	14.05	534.78	535.34	0.957E 03	0.103E 01	177.50	177.42
160	36.02	14.15	534.82	535.31	0.110E 04	0.117E 01	177.51	177.45
161	38.03	14.26	534.89	535.41	0.124E 04	0.131E 01	177.55	177.48
162	35.49	16.88	534.96	535.45	0.113E 04	0.117E 01	177.58	177.49
163	38.69	25.26	534.92	535.55	0.859E 03	0.893E 00	177.62	177.43
164	38.79	27.16	534.99	535.52	0.767E 03	0.800E 00	177.64	177.45
165	38.89	29.93	534.99	535.55	0.617E 03	0.644E 00	177.65	177.39
166	38.99	32.44	534.99	535.55	0.458E 03	0.490E 00	177.67	177.29
167	39.14	34.84	534.99	535.55	0.319E 03	0.328E 00	177.68	177.08
168	39.24	37.16	535.06	535.55	0.159E 03	0.162E 00	177.70	176.59
169	39.24	38.42	535.10	535.62	0.637E 02	0.613E-01	177.72	174.68
171	33.24	13.83	535.20	535.72	0.914E 03	0.948E 00	177.60	177.52
172	33.19	19.64	535.30	535.72	0.716E 03	0.752E 00	177.64	177.54

TABLE 8 EXPERIMENTAL GAS FLOW DATA FOR CORE 2
(CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
173	33.24	23.33	535.37	535.83	0.561E 03	0.596E 00	177.68	177.51
174	33.34	26.30	535.27	535.83	0.420E 03	0.448E 00	177.68	177.38
175	33.49	28.95	535.37	535.83	0.284E 03	0.298E 00	177.71	177.32
176	33.65	30.98	535.41	535.86	0.172E 03	0.174E 00	177.72	177.04
178	28.85	13.81	535.44	535.90	0.641E 03	0.679E 00	177.63	177.55
179	28.90	20.17	535.58	535.97	0.428E 03	0.450E 00	177.68	177.55
180	28.95	24.11	535.51	535.93	0.257E 03	0.271E 00	177.69	177.40
181	29.00	26.87	535.51	535.93	0.119E 03	0.128E 00	177.70	177.02
183	23.80	13.66	535.58	536.00	0.380E 03	0.412E 00	177.63	177.54
184	23.90	17.29	535.65	536.07	0.272E 03	0.286E 00	177.67	177.50
189	18.40	17.79	535.62	536.07	0.220E 02	0.245E-01	177.64	175.97
192	14.11	13.90	536.73	537.42	0.608E 01	0.694E-02	177.91	172.48
193	14.11	13.90	536.86	537.49	0.594E 01	0.642E-02	177.93	172.91
194	14.12	13.93	537.04	537.67	0.519E 01	0.562E-02	177.98	172.24
196	14.11	13.94	537.28	537.81	0.472E 01	0.542E-02	178.02	172.73
197	14.11	13.73	537.38	537.87	0.104E 02	0.122E-01	178.04	175.81
198	14.11	13.73	537.49	537.94	0.106E 02	0.123E-01	178.07	176.02
200	14.41	14.15	537.73	538.05	0.725E 01	0.772E-02	178.11	175.92
201	14.41	14.16	537.70	537.98	0.726E 01	0.787E-02	178.10	176.14
202	14.41	13.86	537.77	538.05	0.153E 02	0.167E-01	178.11	177.20
203	14.41	13.87	537.83	538.12	0.152E 02	0.168E-01	178.13	177.21
204	14.41	13.90	537.90	538.19	0.143E 02	0.161E-01	178.15	177.17
205	14.48	14.23	537.90	538.12	0.729E 01	0.783E-02	178.14	176.65
206	14.48	14.23	537.94	538.12	0.730E 01	0.777E-02	178.15	175.90
207	14.49	14.00	538.01	538.15	0.139E 02	0.165E-01	178.16	177.64
208	14.49	14.00	538.01	538.15	0.139E 02	0.165E-01	178.16	177.64
209	14.49	13.81	538.04	538.22	0.190E 02	0.215E-01	178.17	177.70
210	14.49	13.82	538.08	538.29	0.190E 02	0.213E-01	178.18	177.62
213	14.26	14.05	537.00	537.15	0.596E 01	0.699E-02	177.91	176.71
214	14.26	14.05	537.04	537.25	0.599E 01	0.692E-02	177.93	176.17
215	14.65	14.23	538.18	535.13	0.121E 02	0.138E-01	177.81	191.94
216	14.65	14.24	535.06	535.13	0.120E 02	0.138E-01	177.42	177.11
217	14.64	14.01	535.13	535.24	0.181E 02	0.210E-01	177.44	177.14
218	14.64	14.01	535.20	535.34	0.181E 02	0.207E-01	177.46	177.06
219	14.64	14.01	535.30	535.48	0.181E 02	0.208E-01	177.49	176.99
220	14.94	14.63	535.69	535.97	0.922E 01	0.106E-01	177.61	175.96
221	14.94	14.63	535.69	535.97	0.920E 01	0.106E-01	177.61	175.96
222	14.92	14.19	535.69	535.97	0.213E 02	0.244E-01	177.60	176.91
223	14.92	14.18	536.00	536.25	0.214E 02	0.247E-01	177.68	177.07
224	15.20	14.30	536.03	536.28	0.267E 02	0.319E-01	177.69	177.19

TABLE 8 EXPERIMENTAL GAS FLOW DATA FOR CORE 2
(CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	WSC (SCFH)	VX (MMP)	VIAV (MMP)
225	15.20	14.30	536.10	536.35	0.267E 02	0.319E-01	177.70	177.20
226	15.20	14.29	536.14	536.38	0.269E 02	0.317E-01	177.71	177.22
227	15.20	14.28	536.21	536.45	0.270E 02	0.318E-01	177.73	177.24
228	15.19	13.73	536.21	536.45	0.421E 02	0.559E-01	177.73	177.42
229	15.57	13.74	536.21	536.45	0.536E 02	0.713E-01	177.73	177.48
230	15.57	13.82	536.27	536.52	0.513E 02	0.592E-01	177.75	177.49
231	15.56	13.82	536.31	536.56	0.513E 02	0.592E-01	177.75	177.50

TABLE 9 APPARENT GAS PERMEABILITY RESULTS FOR CORE 2

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
1	0.99981	0.1519E 02	0.2034E 02	0.07144	0.2034E 02	0.2037E 02
2	0.99980	0.2957E 02	0.1995E 02	0.06957	0.1995E 02	0.1996E 02
3	0.99980	0.4185E 02	0.2063E 02	0.06824	0.2063E 02	0.2064E 02
4	0.99980	0.4904E 02	0.1944E 02	0.06708	0.1944E 02	0.1944E 02
5	0.99980	0.5753E 02	0.1907E 02	0.06596	0.1907E 02	0.1907E 02
6	0.99979	0.6570E 02	0.1866E 02	0.06488	0.1866E 02	0.1867E 02
7	0.99979	0.7357E 02	0.1826E 02	0.06380	0.1826E 02	0.1826E 02
8	0.99979	0.8416E 02	0.1859E 02	0.06278	0.1859E 02	0.1859E 02
9	0.99978	0.9009E 02	0.1796E 02	0.06181	0.1796E 02	0.1796E 02
10	0.99978	0.9868E 02	0.1795E 02	0.06088	0.1795E 02	0.1795E 02
11	0.99978	0.1083E 03	0.1797E 02	0.05989	0.1797E 02	0.1797E 02
12	0.99977	0.1176E 03	0.1806E 02	0.05900	0.1806E 02	0.1805E 02
13	0.99977	0.1240E 03	0.1769E 02	0.05813	0.1769E 02	0.1768E 02
14	0.99977	0.1329E 03	0.1773E 02	0.05729	0.1773E 02	0.1772E 02
15	0.99976	0.1415E 03	0.1771E 02	0.05647	0.1771E 02	0.1771E 02
16	0.99976	0.1510E 03	0.1772E 02	0.05560	0.1772E 02	0.1771E 02
17	0.99976	0.1565E 03	0.1740E 02	0.05486	0.1740E 02	0.1740E 02
18	0.99975	0.1642E 03	0.1729E 02	0.05408	0.1729E 02	0.1729E 02
19	0.99975	0.1730E 03	0.1731E 02	0.05333	0.1731E 02	0.1731E 02
20	0.99975	0.1805E 03	0.1723E 02	0.05263	0.1723E 02	0.1723E 02
21	0.99975	0.1899E 03	0.1729E 02	0.05191	0.1729E 02	0.1729E 02
22	0.99974	0.1968E 03	0.1715E 02	0.05123	0.1715E 02	0.1715E 02
23	0.99974	0.2047E 03	0.1711E 02	0.05056	0.1711E 02	0.1711E 02
24	0.99974	0.2112E 03	0.1697E 02	0.04991	0.1697E 02	0.1697E 02
25	0.99973	0.2196E 03	0.1694E 02	0.04925	0.1694E 02	0.1694E 02
26	0.99973	0.2269E 03	0.1686E 02	0.04864	0.1686E 02	0.1686E 02
27	0.99973	0.2349E 03	0.1683E 02	0.04803	0.1683E 02	0.1683E 02
28	0.99972	0.2407E 03	0.1666E 02	0.04744	0.1666E 02	0.1666E 02
29	0.99972	0.2483E 03	0.1661E 02	0.04685	0.1661E 02	0.1661E 02
30	0.99972	0.2569E 03	0.1665E 02	0.04629	0.1665E 02	0.1665E 02
31	0.99971	0.2652E 03	0.1665E 02	0.04573	0.1665E 02	0.1665E 02
32	0.99971	0.2723E 03	0.1659E 02	0.04519	0.1659E 02	0.1659E 02
33	0.99971	0.2801E 03	0.1656E 02	0.04465	0.1656E 02	0.1656E 02
34	0.99970	0.2865E 03	0.1644E 02	0.04410	0.1644E 02	0.1644E 02
35	0.99970	0.2931E 03	0.1636E 02	0.04360	0.1636E 02	0.1636E 02
36	0.99970	0.2965E 03	0.1611E 02	0.04310	0.1611E 02	0.1611E 02
37	0.99969	0.3084E 03	0.1632E 02	0.04262	0.1632E 02	0.1632E 02
38	0.99969	0.3227E 03	0.1621E 02	0.04164	0.1621E 02	0.1621E 02
39	0.99968	0.3294E 03	0.1617E 02	0.04121	0.1617E 02	0.1617E 02
40	0.99968	0.3358E 03	0.1609E 02	0.04077	0.1609E 02	0.1610E 02

TABLE 9 APPARENT GAS PERMEABILITY RESULTS FOR CORE 2 (CONTINUED)

RUN	ZX	FOK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
41	0.99968	0.3430E 03	0.1606E 02	0.04034	0.1606E 02	0.1606E 02
42	0.99967	0.3515E 03	0.1606E 02	0.03989	0.1606E 02	0.1606E 02
43	0.99967	0.3577E 03	0.1601E 02	0.03950	0.1601E 02	0.1601E 02
44	0.99967	0.3642E 03	0.1593E 02	0.03907	0.1593E 02	0.1593E 02
45	0.99967	0.3716E 03	0.1591E 02	0.03867	0.1591E 02	0.1591E 02
46	0.99966	0.3776E 03	0.1567E 02	0.03808	0.1567E 02	0.1567E 02
47	0.99966	0.3856E 03	0.1584E 02	0.03788	0.1584E 02	0.1585E 02
48	0.99966	0.3924E 03	0.1581E 02	0.03751	0.1581E 02	0.1581E 02
49	0.99965	0.3986E 03	0.1572E 02	0.03711	0.1572E 02	0.1573E 02
50	0.99965	0.4061E 03	0.1573E 02	0.03676	0.1573E 02	0.1573E 02
51	0.99965	0.4124E 03	0.1567E 02	0.03639	0.1567E 02	0.1567E 02
52	0.99964	0.4210E 03	0.1571E 02	0.03605	0.1571E 02	0.1571E 02
53	0.99964	0.4257E 03	0.1562E 02	0.03572	0.1562E 02	0.1562E 02
54	0.99963	0.4514E 03	0.1534E 02	0.03424	0.1534E 02	0.1534E 02
55	0.99962	0.4649E 03	0.1509E 02	0.03338	0.1509E 02	0.1510E 02
56	0.99960	0.4921E 03	0.1500E 02	0.03215	0.1500E 02	0.1500E 02
57	0.99959	0.5097E 03	0.1500E 02	0.03147	0.1500E 02	0.1500E 02
58	0.99958	0.5287E 03	0.1488E 02	0.03062	0.1488E 02	0.1489E 02
59	0.99957	0.5496E 03	0.1474E 02	0.02970	0.1474E 02	0.1474E 02
60	0.99956	0.5708E 03	0.1469E 02	0.02892	0.1469E 02	0.1469E 02
61	0.99955	0.5848E 03	0.1462E 02	0.02836	0.1462E 02	0.1462E 02
62	0.99954	0.6014E 03	0.1454E 02	0.02775	0.1454E 02	0.1455E 02
63	0.99954	0.6200E 03	0.1483E 02	0.02792	0.1483E 02	0.1484E 02
64	0.99952	0.6520E 03	0.1460E 02	0.02668	0.1460E 02	0.1460E 02
65	0.99950	0.6942E 03	0.1434E 02	0.02518	0.1434E 02	0.1435E 02
66	0.99941	0.8132E 03	0.1370E 02	0.02146	0.1370E 02	0.1371E 02
67	0.99932	0.9189E 03	0.1312E 02	0.01856	0.1312E 02	0.1312E 02
68	0.99927	0.9700E 03	0.1278E 02	0.01720	0.1278E 02	0.1278E 02
69	0.99921	0.1027E 04	0.1242E 02	0.01583	0.1242E 02	0.1243E 02
70	0.99914	0.1087E 04	0.1206E 02	0.01449	0.1206E 02	0.1207E 02
71	0.99909	0.1135E 04	0.1181E 02	0.01352	0.1181E 02	0.1182E 02
72	0.99904	0.1168E 04	0.1156E 02	0.01282	0.1156E 02	0.1157E 02
73	0.99897	0.1210E 04	0.1123E 02	0.01193	0.1123E 02	0.1124E 02
74	0.99889	0.1256E 04	0.1089E 02	0.01101	0.1089E 02	0.1090E 02
75	0.99884	0.1289E 04	0.1071E 02	0.01046	0.1071E 02	0.1073E 02
76	0.99878	0.1318E 04	0.1052E 02	0.00993	0.1052E 02	0.1053E 02
77	0.99873	0.1343E 04	0.1029E 02	0.00944	0.1029E 02	0.1031E 02
78	0.99870	0.1354E 04	0.1019E 02	0.00922	0.1019E 02	0.1021E 02
79	0.99870	0.1323E 04	0.9955E 01	0.00922	0.9954E 01	0.9969E 01
80	0.99830	0.1422E 04	0.9036E 01	0.00674	0.9035E 01	0.9054E 01

TABLE 9 APPARENT GAS PERMEABILITY RESULTS FOR CORE 2
(CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
81	0.99810	0.1447E 04	0.8285E 01	0.00592	0.8285E 01	0.8305E 01
82	0.99804	0.1469E 04	0.8271E 01	0.00568	0.8271E 01	0.8292E 01
83	0.99787	0.1492E 04	0.7807E 01	0.00515	0.7807E 01	0.7830E 01
84	0.99771	0.1553E 04	0.7592E 01	0.00471	0.7592E 01	0.7617E 01
85	0.99744	0.1608E 04	0.7045E 01	0.00406	0.7045E 01	0.7071E 01
86	0.99714	0.1660E 04	0.6517E 01	0.00350	0.6518E 01	0.6544E 01
87	0.99689	0.1718E 04	0.6155E 01	0.00309	0.6156E 01	0.6185E 01
88	0.99669	0.1755E 04	0.5838E 01	0.00276	0.5839E 01	0.5870E 01
89	0.99649	0.1761E 04	0.5285E 01	0.00251	0.5287E 01	0.5316E 01
90	0.99633	0.1818E 04	0.5242E 01	0.00230	0.5244E 01	0.5275E 01
91	0.99641	0.1798E 04	0.5401E 01	0.00242	0.5403E 01	0.5435E 01
92	0.99658	0.1759E 04	0.5666E 01	0.00265	0.5668E 01	0.5700E 01
93	0.99679	0.1729E 04	0.6037E 01	0.00295	0.6038E 01	0.6073E 01
94	0.99703	0.1675E 04	0.6386E 01	0.00331	0.6388E 01	0.6421E 01
95	0.99728	0.1619E 04	0.6776E 01	0.00376	0.6777E 01	0.6811E 01
96	0.99759	0.1565E 04	0.7378E 01	0.00440	0.7379E 01	0.7414E 01
97	0.99798	0.1453E 04	0.8060E 01	0.00548	0.8060E 01	0.8094E 01
98	0.99822	0.1399E 04	0.8701E 01	0.00638	0.8701E 01	0.8735E 01
99	0.99841	0.1360E 04	0.9318E 01	0.00724	0.9318E 01	0.9352E 01
100	0.99841	0.1372E 04	0.9418E 01	0.00725	0.9418E 01	0.9451E 01
101	0.99859	0.1302E 04	0.9924E 01	0.00832	0.9924E 01	0.9955E 01
102	0.99876	0.1238E 04	0.1056E 02	0.00960	0.1056E 02	0.1059E 02
103	0.99896	0.1149E 04	0.1137E 02	0.01166	0.1137E 02	0.1140E 02
104	0.99915	0.1064E 04	0.1220E 02	0.01434	0.1220E 02	0.1222E 02
106	0.99926	0.9768E 03	0.1289E 02	0.01677	0.1289E 02	0.1291E 02
107	0.99926	0.9735E 03	0.1272E 02	0.01667	0.1272E 02	0.1274E 02
108	0.99934	0.8952E 03	0.1317E 02	0.01877	0.1317E 02	0.1320E 02
109	0.99940	0.8283E 03	0.1362E 02	0.02094	0.1362E 02	0.1364E 02
110	0.99948	0.7301E 03	0.1410E 02	0.02392	0.1410E 02	0.1412E 02
111	0.99955	0.6203E 03	0.1466E 02	0.02767	0.1466E 02	0.1468E 02
112	0.99960	0.5057E 03	0.1495E 02	0.03191	0.1495E 02	0.1497E 02
115	0.99980	0.1191E 02	0.2111E 02	0.07209	0.2111E 02	0.2086E 02
116	0.99980	0.1521E 02	0.2015E 02	0.07159	0.2015E 02	0.1999E 02
117	0.99979	0.1679E 02	0.1798E 02	0.07113	0.1798E 02	0.1787E 02
118	0.99979	0.2167E 02	0.1934E 02	0.07065	0.1934E 02	0.1923E 02
119	0.99979	0.2652E 02	0.2068E 02	0.07025	0.2068E 02	0.2057E 02
121	0.99979	0.3105E 02	0.1874E 02	0.06932	0.1874E 02	0.1865E 02
122	0.99979	0.3410E 02	0.1850E 02	0.06887	0.1850E 02	0.1843E 02
123	0.99978	0.2218E 02	0.1941E 02	0.06715	0.1941E 02	0.1928E 02
124	0.99978	0.1247E 02	0.1867E 02	0.06604	0.1857E 02	0.1845E 02

TABLE 9 APPARENT GAS PERMEABILITY RESULTS FOR CORE 2
(CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
125	0.99979	0.3409E 02	0.1854E 02	0.06885	0.1854E 02	0.1846E 02
126	0.99978	0.5888E 02	0.1872E 02	0.06583	0.1872E 02	0.1867E 02
127	0.99977	0.7622E 02	0.1813E 02	0.06356	0.1813E 02	0.1809E 02
128	0.99977	0.9412E 02	0.1830E 02	0.06166	0.1830E 02	0.1827E 02
129	0.99976	0.1095E 03	0.1794E 02	0.05984	0.1794E 02	0.1792E 02
130	0.99975	0.1252E 03	0.1770E 02	0.05809	0.1770E 02	0.1768E 02
131	0.99975	0.1424E 03	0.1760E 02	0.05636	0.1760E 02	0.1758E 02
132	0.99974	0.1575E 03	0.1738E 02	0.05480	0.1738E 02	0.1736E 02
133	0.99973	0.1717E 03	0.1723E 02	0.05341	0.1723E 02	0.1719E 02
134	0.99973	0.1570E 03	0.1738E 02	0.05212	0.1738E 02	0.1736E 02
136	0.99971	0.1229E 03	0.1675E 02	0.04910	0.1675E 02	0.1673E 02
137	0.99968	0.6452E 02	0.1646E 02	0.04499	0.1646E 02	0.1643E 02
143	0.99979	0.1686E 02	0.2049E 02	0.07187	0.2049E 02	0.2031E 02
144	0.99979	0.2011E 02	0.2063E 02	0.07147	0.2063E 02	0.2048E 02
145	0.99979	0.2333E 02	0.2086E 02	0.07111	0.2086E 02	0.2072E 02
147	0.99979	0.2965E 02	0.2098E 02	0.07035	0.2098E 02	0.2086E 02
148	0.99979	0.3115E 02	0.2017E 02	0.07003	0.2017E 02	0.2006E 02
149	0.99980	0.2958E 02	0.1998E 02	0.07018	0.1998E 02	0.1991E 02
150	0.99979	0.4628E 02	0.2019E 02	0.06818	0.2019E 02	0.2015E 02
151	0.99978	0.8205E 02	0.1951E 02	0.06391	0.1951E 02	0.1949E 02
152	0.99977	0.1089E 03	0.1749E 02	0.05993	0.1749E 02	0.1748E 02
153	0.99975	0.1458E 03	0.1795E 02	0.05656	0.1795E 02	0.1794E 02
154	0.99974	0.1721E 03	0.1706E 02	0.05346	0.1706E 02	0.1705E 02
155	0.99973	0.2073E 03	0.1730E 02	0.05074	0.1730E 02	0.1729E 02
156	0.99971	0.2390E 03	0.1706E 02	0.04810	0.1706E 02	0.1705E 02
157	0.99970	0.2697E 03	0.1689E 02	0.04577	0.1689E 02	0.1689E 02
158	0.99968	0.2944E 03	0.1644E 02	0.04368	0.1644E 02	0.1643E 02
159	0.99967	0.3277E 03	0.1645E 02	0.04165	0.1645E 02	0.1644E 02
160	0.99965	0.3550E 03	0.1626E 02	0.03986	0.1626E 02	0.1626E 02
161	0.99964	0.3823E 03	0.1608E 02	0.03824	0.1608E 02	0.1608E 02
162	0.99961	0.3112E 03	0.1587E 02	0.03486	0.1587E 02	0.1586E 02
163	0.99956	0.2137E 03	0.1590E 02	0.03127	0.1590E 02	0.1588E 02
164	0.99955	0.1855E 03	0.1595E 02	0.03032	0.1595E 02	0.1593E 02
165	0.99953	0.1432E 03	0.1596E 02	0.02906	0.1596E 02	0.1594E 02
166	0.99951	0.1050E 03	0.1601E 02	0.02800	0.1601E 02	0.1598E 02
167	0.99950	0.6788E 02	0.1575E 02	0.02703	0.1575E 02	0.1570E 02
168	0.99948	0.3243E 02	0.1554E 02	0.02618	0.1554E 02	0.1545E 02
169	0.99947	0.1208E 02	0.1473E 02	0.02575	0.1473E 02	0.1443E 02
171	0.99968	0.3081E 03	0.1587E 02	0.04249	0.1587E 02	0.1585E 02
172	0.99964	0.2179E 03	0.1608E 02	0.03785	0.1608E 02	0.1607E 02

TABLE 9 APPARENT GAS PERMEABILITY RESULTS FOR CORE 2 (CONTINUED)

RUN	ZK	FOK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
173	0.99962	0.1614E 03	0.1628E 02	0.03535	0.1628E 02	0.1626E 02
174	0.99959	0.1149E 03	0.1631E 02	0.03353	0.1631E 02	0.1623E 02
175	0.99958	0.7302E 02	0.1606E 02	0.03203	0.1606E 02	0.1602E 02
176	0.99956	0.4120E 02	0.1544E 02	0.03095	0.1544E 02	0.1538E 02
178	0.99971	0.2436E 03	0.1620E 02	0.04689	0.1620E 02	0.1619E 02
179	0.99967	0.1406E 03	0.1611E 02	0.04077	0.1611E 02	0.1610E 02
180	0.99964	0.7811E 02	0.1614E 02	0.03770	0.1614E 02	0.1612E 02
182	0.99961	0.6509E 01	0.1315E 02	0.03466	0.1315E 02	0.1292E 02
183	0.99974	0.1684E 03	0.1661E 02	0.05340	0.1661E 02	0.1660E 02
184	0.99972	0.1063E 03	0.1609E 02	0.04856	0.1609E 02	0.1607E 02
189	0.99975	0.1037E 02	0.1710E 02	0.05527	0.1710E 02	0.1694E 02
192	0.99981	0.3812E 01	0.1755E 02	0.07141	0.1755E 02	0.1701E 02
193	0.99982	0.3525E 01	0.1661E 02	0.07140	0.1661E 02	0.1614E 02
194	0.99982	0.3085E 01	0.1666E 02	0.07131	0.1666E 02	0.1613E 02
196	0.99982	0.2973E 01	0.1767E 02	0.07129	0.1767E 02	0.1715E 02
197	0.99982	0.6739E 01	0.1797E 02	0.07184	0.1797E 02	0.1774E 02
198	0.99982	0.6785E 01	0.1779E 02	0.07186	0.1779E 02	0.1758E 02
200	0.99981	0.4165E 01	0.1640E 02	0.07002	0.1640E 02	0.1620E 02
201	0.99981	0.4249E 01	0.1671E 02	0.07002	0.1671E 02	0.1652E 02
202	0.99982	0.9113E 01	0.1681E 02	0.07075	0.1681E 02	0.1673E 02
203	0.99982	0.9139E 01	0.1695E 02	0.07073	0.1695E 02	0.1685E 02
204	0.99982	0.8784E 01	0.1735E 02	0.07064	0.1735E 02	0.1725E 02
205	0.99981	0.4209E 01	0.1658E 02	0.06965	0.1658E 02	0.1644E 02
206	0.99981	0.4175E 01	0.1642E 02	0.06965	0.1642E 02	0.1630E 02
207	0.99982	0.9000E 01	0.1845E 02	0.07020	0.1845E 02	0.1840E 02
208	0.99982	0.8912E 01	0.1827E 02	0.07019	0.1827E 02	0.1822E 02
209	0.99982	0.1170E 02	0.1739E 02	0.07068	0.1739E 02	0.1734E 02
210	0.99982	0.1159E 02	0.1727E 02	0.07065	0.1727E 02	0.1722E 02
213	0.99981	0.3799E 01	0.1803E 02	0.07066	0.1803E 02	0.1791E 02
214	0.99981	0.3759E 01	0.1778E 02	0.07066	0.1778E 02	0.1760E 02
215	0.99981	0.7327E 01	0.1755E 02	0.06924	0.1755E 02	0.1894E 02
216	0.99980	0.7299E 01	0.1752E 02	0.06923	0.1752E 02	0.1749E 02
217	0.99980	0.1119E 02	0.1771E 02	0.06980	0.1771E 02	0.1768E 02
218	0.99980	0.1103E 02	0.1746E 02	0.06982	0.1746E 02	0.1742E 02
219	0.99980	0.1108E 02	0.1755E 02	0.06982	0.1755E 02	0.1750E 02
220	0.99980	0.5491E 01	0.1762E 02	0.06763	0.1762E 02	0.1746E 02
221	0.99980	0.5483E 01	0.1764E 02	0.06762	0.1764E 02	0.1747E 02
222	0.99980	0.1281E 02	0.1754E 02	0.06870	0.1754E 02	0.1747E 02
223	0.99980	0.1299E 02	0.1769E 02	0.06873	0.1770E 02	0.1763E 02
224	0.99980	0.1660E 02	0.1837E 02	0.06780	0.1837E 02	0.1832E 02

TABLE 9 APPARENT GAS PERMEABILITY RESULTS FOR CORE 2
(CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
225	0.99980	0.1656E 02	0.1832E 02	0.06781	0.1832E 02	0.1827E 02
226	0.99980	0.1649E 02	0.1806E 02	0.06783	0.1806E 02	0.1801E 02
227	0.99980	0.1657E 02	0.1812E 02	0.06784	0.1812E 02	0.1807E 02
228	0.99981	0.2964E 02	0.2036E 02	0.06915	0.2036E 02	0.2033E 02
229	0.99980	0.3736E 02	0.2042E 02	0.06826	0.2042E 02	0.2039E 02
230	0.99980	0.3090E 02	0.1770E 02	0.06805	0.1770E 02	0.1768E 02
231	0.99980	0.3090E 02	0.1771E 02	0.06808	0.1771E 02	0.1769E 02

TABLE 10 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 2

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
1	0.46290E 13	0.72034E 00	0.46290E 13	0.46208E 13	0.71907E 00
2	0.47184E 13	0.14387E 01	0.47184E 13	0.47152E 13	0.14377E 01
3	0.45621E 13	0.20756E 01	0.45621E 13	0.45614E 13	0.20752E 01
4	0.48430E 13	0.24729E 01	0.48430E 13	0.48423E 13	0.24726E 01
5	0.49369E 13	0.29486E 01	0.49369E 13	0.49351E 13	0.29476E 01
6	0.50434E 13	0.34216E 01	0.50435E 13	0.50424E 13	0.34209E 01
7	0.51552E 13	0.38951E 01	0.51552E 13	0.51542E 13	0.38944E 01
8	0.50642E 13	0.45258E 01	0.50642E 13	0.50633E 13	0.45250E 01
9	0.52408E 13	0.49192E 01	0.52408E 13	0.52400E 13	0.49184E 01
10	0.52450E 13	0.54690E 01	0.52450E 13	0.52446E 13	0.54686E 01
11	0.52377E 13	0.60983E 01	0.52377E 13	0.52377E 13	0.60983E 01
12	0.52135E 13	0.67241E 01	0.52135E 13	0.52139E 13	0.67245E 01
13	0.53223E 13	0.71929E 01	0.53223E 13	0.53230E 13	0.71937E 01
14	0.53103E 13	0.78189E 01	0.53103E 13	0.53109E 13	0.78197E 01
15	0.53143E 13	0.84440E 01	0.53143E 13	0.53146E 13	0.84444E 01
16	0.53132E 13	0.91434E 01	0.53132E 13	0.53149E 13	0.91462E 01
17	0.54115E 13	0.96090E 01	0.54115E 13	0.54112E 13	0.96084E 01
18	0.54446E 13	0.10230E 02	0.54446E 13	0.54443E 13	0.10229E 02
19	0.54388E 13	0.10927E 02	0.54388E 13	0.54387E 13	0.10926E 02
20	0.54638E 13	0.11546E 02	0.54639E 13	0.54638E 13	0.11545E 02
21	0.54457E 13	0.12317E 02	0.54457E 13	0.54456E 13	0.12317E 02
22	0.54879E 13	0.12932E 02	0.54880E 13	0.54878E 13	0.12931E 02
23	0.55031E 13	0.13623E 02	0.55031E 13	0.55032E 13	0.13623E 02
24	0.55485E 13	0.14234E 02	0.55485E 13	0.55486E 13	0.14234E 02
25	0.55569E 13	0.14997E 02	0.55569E 13	0.55568E 13	0.14997E 02
26	0.55840E 13	0.15682E 02	0.55840E 13	0.55838E 13	0.15682E 02
27	0.55932E 13	0.16445E 02	0.55933E 13	0.55933E 13	0.16445E 02
28	0.56496E 13	0.17055E 02	0.56496E 13	0.56495E 13	0.17055E 02
29	0.56657E 13	0.17815E 02	0.56657E 13	0.56657E 13	0.17815E 02
30	0.56547E 13	0.18652E 02	0.56548E 13	0.56545E 13	0.18651E 02
31	0.56528E 13	0.19487E 02	0.56528E 13	0.56526E 13	0.19487E 02
32	0.56755E 13	0.20241E 02	0.56756E 13	0.56753E 13	0.20240E 02
33	0.56846E 13	0.21072E 02	0.56847E 13	0.56844E 13	0.21071E 02
34	0.57243E 13	0.21821E 02	0.57244E 13	0.57243E 13	0.21821E 02
35	0.57528E 13	0.22567E 02	0.57529E 13	0.57525E 13	0.22566E 02
36	0.58443E 13	0.23089E 02	0.58444E 13	0.58443E 13	0.23089E 02
37	0.57676E 13	0.24287E 02	0.57677E 13	0.57677E 13	0.24287E 02
38	0.58086E 13	0.26004E 02	0.58087E 13	0.58086E 13	0.26004E 02
39	0.58216E 13	0.26817E 02	0.58217E 13	0.58216E 13	0.26817E 02
40	0.58489E 13	0.27631E 02	0.58490E 13	0.58485E 13	0.27629E 02

TABLE 10 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 2
(CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
41	0.58631E 13	0.28525E 02	0.58632E 13	0.58625E 13	0.28522E 02
42	0.58599E 13	0.29554E 02	0.58600E 13	0.58597E 13	0.29553E 02
43	0.58795E 13	0.30363E 02	0.58796E 13	0.58795E 13	0.30362E 02
44	0.59092E 13	0.31242E 02	0.59094E 13	0.59090E 13	0.31241E 02
45	0.59155E 13	0.32202E 02	0.59157E 13	0.59153E 13	0.32201E 02
46	0.60089E 13	0.33225E 02	0.60090E 13	0.60086E 13	0.33223E 02
47	0.59411E 13	0.34104E 02	0.59413E 13	0.59409E 13	0.34102E 02
48	0.59555E 13	0.35045E 02	0.59556E 13	0.59550E 13	0.35041E 02
49	0.59863E 13	0.35985E 02	0.59865E 13	0.59856E 13	0.35980E 02
50	0.59855E 13	0.37001E 02	0.59856E 13	0.59850E 13	0.36998E 02
51	0.60065E 13	0.37944E 02	0.60066E 13	0.60060E 13	0.37940E 02
52	0.59911E 13	0.39098E 02	0.59912E 13	0.59907E 13	0.39094E 02
53	0.60263E 13	0.39896E 02	0.60265E 13	0.60259E 13	0.39893E 02
54	0.61358E 13	0.44125E 02	0.61359E 13	0.61353E 13	0.44121E 02
55	0.62369E 13	0.46614E 02	0.62370E 13	0.62358E 13	0.46605E 02
56	0.62771E 13	0.51219E 02	0.62773E 13	0.62760E 13	0.51208E 02
57	0.62750E 13	0.54174E 02	0.62752E 13	0.62744E 13	0.54166E 02
58	0.63250E 13	0.57725E 02	0.63253E 13	0.63240E 13	0.57714E 02
59	0.63870E 13	0.61865E 02	0.63873E 13	0.63856E 13	0.61848E 02
60	0.64067E 13	0.65994E 02	0.64090E 13	0.64073E 13	0.65977E 02
61	0.64391E 13	0.68943E 02	0.64394E 13	0.64379E 13	0.68927E 02
62	0.64720E 13	0.72451E 02	0.64723E 13	0.64705E 13	0.72431E 02
63	0.63459E 13	0.74228E 02	0.63462E 13	0.63444E 13	0.74208E 02
64	0.64489E 13	0.81657E 02	0.64492E 13	0.64471E 13	0.81631E 02
65	0.65634E 13	0.92101E 02	0.65638E 13	0.65615E 13	0.92068E 02
66	0.68701E 13	0.12648E 03	0.68706E 13	0.68676E 13	0.12642E 03
67	0.71759E 13	0.16520E 03	0.71765E 13	0.71729E 13	0.16511E 03
68	0.73675E 13	0.18810E 03	0.73681E 13	0.73637E 13	0.18799E 03
69	0.75791E 13	0.21625E 03	0.75798E 13	0.75747E 13	0.21611E 03
70	0.78048E 13	0.24988E 03	0.78056E 13	0.77994E 13	0.24968E 03
71	0.79727E 13	0.27946E 03	0.79735E 13	0.79665E 13	0.27921E 03
72	0.81417E 13	0.30321E 03	0.81425E 13	0.81346E 13	0.30291E 03
73	0.83826E 13	0.33742E 03	0.83834E 13	0.83740E 13	0.33704E 03
74	0.86459E 13	0.37920E 03	0.86469E 13	0.86358E 13	0.37872E 03
75	0.87863E 13	0.40933E 03	0.87873E 13	0.87755E 13	0.40879E 03
76	0.89510E 13	0.44035E 03	0.89519E 13	0.89395E 13	0.43973E 03
77	0.91450E 13	0.47220E 03	0.91460E 13	0.91327E 13	0.47151E 03
78	0.92357E 13	0.48718E 03	0.92367E 13	0.92227E 13	0.48644E 03
79	0.94563E 13	0.47581E 03	0.94573E 13	0.94427E 13	0.47508E 03
80	0.10418E 14	0.69525E 03	0.10419E 14	0.10397E 14	0.69378E 03

TABLE 10 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 2
(CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
81	0.11361E 14	0.80349E 03	0.11362E 14	0.11335E 14	0.80158E 03
82	0.11381E 14	0.84980E 03	0.11382E 14	0.11352E 14	0.84760E 03
83	0.12058E 14	0.94927E 03	0.12058E 14	0.12022E 14	0.94644E 03
84	0.12399E 14	0.10786E 04	0.12399E 14	0.12359E 14	0.10751E 04
85	0.13362E 14	0.12886E 04	0.13361E 14	0.13313E 14	0.12840E 04
86	0.14444E 14	0.15397E 04	0.14443E 14	0.14385E 14	0.15336E 04
87	0.15294E 14	0.17951E 04	0.15291E 14	0.15220E 14	0.17868E 04
88	0.16124E 14	0.20381E 04	0.16121E 14	0.16038E 14	0.20276E 04
89	0.17810E 14	0.22445E 04	0.17805E 14	0.17708E 14	0.22323E 04
90	0.17957E 14	0.25143E 04	0.17951E 14	0.17845E 14	0.24995E 04
91	0.17428E 14	0.23738E 04	0.17422E 14	0.17320E 14	0.23599E 04
92	0.16613E 14	0.21310E 04	0.16609E 14	0.16515E 14	0.21191E 04
93	0.15593E 14	0.18900E 04	0.15590E 14	0.15501E 14	0.18793E 04
94	0.14740E 14	0.16365E 04	0.14737E 14	0.14660E 14	0.16278E 04
95	0.13892E 14	0.14005E 04	0.13890E 14	0.13820E 14	0.13934E 04
96	0.12759E 14	0.11613E 04	0.12758E 14	0.12697E 14	0.11557E 04
97	0.11680E 14	0.86967E 03	0.11679E 14	0.11630E 14	0.86602E 03
98	0.10819E 14	0.72153E 03	0.10819E 14	0.10777E 14	0.71873E 03
99	0.10103E 14	0.61961E 03	0.10103E 14	0.10066E 14	0.61735E 03
100	0.99948E 13	0.62436E 03	0.99949E 13	0.99603E 13	0.62220E 03
101	0.94855E 13	0.51713E 03	0.94858E 13	0.94556E 13	0.51549E 03
102	0.89178E 13	0.42692E 03	0.89182E 13	0.88916E 13	0.42565E 03
103	0.82765E 13	0.32681E 03	0.82769E 13	0.82544E 13	0.32593E 03
104	0.77185E 13	0.24667E 03	0.77190E 13	0.77004E 13	0.24607E 03
106	0.73048E 13	0.19377E 03	0.73053E 13	0.72902E 13	0.19337E 03
107	0.74008E 13	0.19428E 03	0.74013E 13	0.73870E 13	0.19390E 03
108	0.71457E 13	0.15875E 03	0.71461E 13	0.71327E 13	0.15845E 03
109	0.69112E 13	0.13178E 03	0.69116E 13	0.69000E 13	0.13156E 03
110	0.66756E 13	0.10178E 03	0.66759E 13	0.66650E 13	0.10162E 03
111	0.64213E 13	0.74770E 02	0.64215E 13	0.64120E 13	0.74660E 02
112	0.62968E 13	0.52878E 02	0.62970E 13	0.62883E 13	0.52805E 02
115	0.44593E 13	0.56772E 00	0.44592E 13	0.45126E 13	0.57452E 00
116	0.46726E 13	0.72972E 00	0.46725E 13	0.47084E 13	0.73532E 00
117	0.52354E 13	0.81042E 00	0.52353E 13	0.52680E 13	0.81549E 00
118	0.48684E 13	0.10527E 01	0.48683E 13	0.48953E 13	0.10586E 01
119	0.45521E 13	0.12950E 01	0.45520E 13	0.45755E 13	0.13016E 01
121	0.50222E 13	0.15362E 01	0.50222E 13	0.50435E 13	0.15427E 01
122	0.50875E 13	0.16968E 01	0.50875E 13	0.51071E 13	0.17033E 01
123	0.48493E 13	0.11316E 01	0.48493E 13	0.48816E 13	0.11391E 01
124	0.50412E 13	0.64685E 00	0.50411E 13	0.51024E 13	0.65471E 00

TABLE 10 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 2 (CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
125	0.50765E 13	0.16955E 01	0.50764E 13	0.50980E 13	0.17027E 01
126	0.50276E 13	0.30621E 01	0.50275E 13	0.50407E 13	0.30701E 01
127	0.51928E 13	0.41036E 01	0.51928E 13	0.52038E 13	0.41123E 01
128	0.51445E 13	0.52219E 01	0.51445E 13	0.51534E 13	0.52309E 01
129	0.52469E 13	0.62571E 01	0.52469E 13	0.52544E 13	0.62661E 01
130	0.53176E 13	0.73697E 01	0.53176E 13	0.53244E 13	0.73792E 01
131	0.53479E 13	0.86362E 01	0.53479E 13	0.53541E 13	0.86462E 01
132	0.54161E 13	0.98209E 01	0.54161E 13	0.54214E 13	0.98304E 01
133	0.54627E 13	0.11012E 02	0.54627E 13	0.54754E 13	0.11038E 02
134	0.54176E 13	0.10290E 02	0.54176E 13	0.54228E 13	0.10300E 02
136	0.56194E 13	0.85492E 01	0.56194E 13	0.56260E 13	0.85592E 01
137	0.57182E 13	0.48939E 01	0.57182E 13	0.57309E 13	0.49048E 01
143	0.45940E 13	0.81022E 00	0.45939E 13	0.46356E 13	0.81757E 00
144	0.45633E 13	0.97102E 00	0.45632E 13	0.45967E 13	0.97815E 00
145	0.45120E 13	0.11321E 01	0.45118E 13	0.45437E 13	0.11401E 01
147	0.44859E 13	0.14515E 01	0.44858E 13	0.45123E 13	0.14601E 01
148	0.46670E 13	0.15316E 01	0.46669E 13	0.46932E 13	0.15402E 01
149	0.47126E 13	0.14362E 01	0.47125E 13	0.47270E 13	0.14406E 01
150	0.46634E 13	0.23108E 01	0.46634E 13	0.46722E 13	0.23152E 01
151	0.48240E 13	0.43702E 01	0.48240E 13	0.48298E 13	0.43754E 01
152	0.53816E 13	0.61827E 01	0.53816E 13	0.53866E 13	0.61885E 01
153	0.52429E 13	0.87688E 01	0.52430E 13	0.52470E 13	0.87755E 01
154	0.55175E 13	0.10949E 02	0.55176E 13	0.55217E 13	0.10958E 02
155	0.54411E 13	0.13889E 02	0.54412E 13	0.54443E 13	0.13897E 02
156	0.55165E 13	0.16887E 02	0.55166E 13	0.55199E 13	0.16897E 02
157	0.55720E 13	0.20016E 02	0.55721E 13	0.55748E 13	0.20026E 02
158	0.57252E 13	0.22893E 02	0.57253E 13	0.57278E 13	0.22903E 02
159	0.57238E 13	0.26718E 02	0.57239E 13	0.57266E 13	0.26731E 02
160	0.57881E 13	0.30297E 02	0.57882E 13	0.57904E 13	0.30309E 02
161	0.58531E 13	0.33918E 02	0.58532E 13	0.58555E 13	0.33931E 02
162	0.59321E 13	0.30278E 02	0.59322E 13	0.59352E 13	0.30293E 02
163	0.59199E 13	0.23162E 02	0.59200E 13	0.59263E 13	0.23187E 02
164	0.59016E 13	0.20737E 02	0.59017E 13	0.59079E 13	0.20759E 02
165	0.58966E 13	0.16694E 02	0.58967E 13	0.59056E 13	0.16719E 02
166	0.58791E 13	0.12701E 02	0.58792E 13	0.58918E 13	0.12728E 02
167	0.59758E 13	0.85060E 01	0.59759E 13	0.59960E 13	0.85346E 01
168	0.60556E 13	0.41959E 01	0.60558E 13	0.60939E 13	0.42223E 01
169	0.63903E 13	0.15878E 01	0.63909E 13	0.65021E 13	0.16154E 01
171	0.59327E 13	0.24574E 02	0.59328E 13	0.59355E 13	0.24585E 02
172	0.58539E 13	0.19502E 02	0.58539E 13	0.58573E 13	0.19513E 02

TABLE 10 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 2
(CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
173	0.57823E 13	0.15451E 02	0.57823E 13	0.57876E 13	0.15466E 02
174	0.57730E 13	0.11602E 02	0.57730E 13	0.57827E 13	0.11622E 02
175	0.58627E 13	0.77151E 01	0.58628E 13	0.58756E 13	0.77320E 01
176	0.60965E 13	0.45043E 01	0.60966E 13	0.61201E 13	0.45217E 01
178	0.58107E 13	0.17593E 02	0.58107E 13	0.58134E 13	0.17601E 02
179	0.58439E 13	0.11672E 02	0.58439E 13	0.58484E 13	0.11681E 02
180	0.58315E 13	0.70113E 01	0.58315E 13	0.58409E 13	0.70227E 01
181	0.56778E 13	0.33240E 01	0.56778E 13	0.56999E 13	0.33359E 01
183	0.56673E 13	0.10673E 02	0.56673E 13	0.56705E 13	0.10679E 02
184	0.58518E 13	0.74036E 01	0.58519E 13	0.58573E 13	0.74104E 01
189	0.55055E 13	0.63533E 00	0.55056E 13	0.55578E 13	0.64136E 00
192	0.53639E 13	0.17971E 00	0.53638E 13	0.55326E 13	0.18537E 00
193	0.56664E 13	0.16611E 00	0.56663E 13	0.58308E 13	0.17094E 00
194	0.56497E 13	0.14545E 00	0.56496E 13	0.58378E 13	0.15030E 00
196	0.53260E 13	0.14010E 00	0.53259E 13	0.54890E 13	0.14439E 00
197	0.52382E 13	0.31499E 00	0.52382E 13	0.53049E 13	0.31900E 00
198	0.52923E 13	0.31693E 00	0.52922E 13	0.53538E 13	0.32062E 00
200	0.57386E 13	0.19951E 00	0.57385E 13	0.58102E 13	0.20200E 00
201	0.56342E 13	0.20356E 00	0.56342E 13	0.56967E 13	0.20582E 00
202	0.55994E 13	0.43196E 00	0.55994E 13	0.56283E 13	0.43419E 00
203	0.55538E 13	0.43314E 00	0.55538E 13	0.55826E 13	0.43539E 00
204	0.54269E 13	0.41673E 00	0.54269E 13	0.54569E 13	0.41903E 00
205	0.56790E 13	0.20255E 00	0.56790E 13	0.57270E 13	0.20425E 00
206	0.57340E 13	0.20087E 00	0.57340E 13	0.57745E 13	0.20229E 00
207	0.51010E 13	0.42957E 00	0.51010E 13	0.51160E 13	0.43084E 00
208	0.51512E 13	0.42544E 00	0.51512E 13	0.51664E 13	0.42669E 00
209	0.54131E 13	0.55458E 00	0.54131E 13	0.54273E 13	0.55604E 00
210	0.54503E 13	0.54938E 00	0.54503E 13	0.54675E 13	0.55111E 00
213	0.52212E 13	0.18102E 00	0.52212E 13	0.52565E 13	0.18224E 00
214	0.52948E 13	0.17906E 00	0.52948E 13	0.53477E 13	0.18084E 00
215	0.53651E 13	0.35697E 00	0.53653E 13	0.49703E 13	0.33070E 00
216	0.53720E 13	0.35819E 00	0.53720E 13	0.53816E 13	0.35883E 00
217	0.53157E 13	0.54426E 00	0.53157E 13	0.53248E 13	0.54519E 00
218	0.53909E 13	0.53626E 00	0.53909E 13	0.54031E 13	0.53748E 00
219	0.53652E 13	0.53851E 00	0.53652E 13	0.53803E 13	0.54003E 00
220	0.53427E 13	0.27493E 00	0.53427E 13	0.53927E 13	0.27750E 00
221	0.53378E 13	0.27455E 00	0.53378E 13	0.53878E 13	0.27712E 00
222	0.53682E 13	0.63146E 00	0.53682E 13	0.53893E 13	0.63394E 00
223	0.53198E 13	0.63920E 00	0.53198E 13	0.53380E 13	0.64139E 00
224	0.51246E 13	0.82796E 00	0.51246E 13	0.51391E 13	0.83030E 00

TABLE 10 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 2
(CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	F1PS (1/SQ FT)	F1Q (1/FT)
225	0.51376E 13	0.82550E 00	0.51376E 13	0.51521E 13	0.82783E 00
226	0.52109E 13	0.82128E 00	0.52109E 13	0.52255E 13	0.82357E 00
227	0.51957E 13	0.82517E 00	0.51957E 13	0.52102E 13	0.82747E 00
228	0.46229E 13	0.14479E 01	0.46229E 13	0.46309E 13	0.14504E 01
229	0.46110E 13	0.18487E 01	0.46110E 13	0.46173E 13	0.18513E 01
230	0.53169E 13	0.15337E 01	0.53169E 13	0.53246E 13	0.15359E 01
231	0.53145E 13	0.15327E 01	0.53145E 13	0.53222E 13	0.15349E 01

TABLE 11 EXPERIMENTAL GAS FLOW DATA FOR CORE 3

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
1	13.80	13.63	537.83	537.87	0.447E 01	0.569E-02	178.10	177.68
2	14.13	13.69	534.61	534.75	0.124E 02	0.157E-01	177.31	176.76
3	14.13	13.68	534.61	534.75	0.124E 02	0.158E-01	177.31	176.76
6	14.56	13.77	535.13	535.24	0.223E 02	0.282E-01	177.44	177.20
7	14.56	13.78	535.27	535.34	0.222E 02	0.282E-01	177.47	177.31
8	14.80	13.81	535.44	535.66	0.283E 02	0.353E-01	177.53	177.15
9	14.80	13.82	535.44	535.62	0.282E 02	0.354E-01	177.53	177.21
10	14.80	13.82	535.48	535.55	0.282E 02	0.355E-01	177.52	177.39
11	15.02	13.86	535.55	535.62	0.334E 02	0.421E-01	177.54	177.43
12	15.02	13.87	535.62	535.72	0.334E 02	0.421E-01	177.56	177.39
13	15.22	13.81	535.62	535.76	0.408E 02	0.509E-01	177.57	177.38
14	15.21	13.81	535.65	535.83	0.408E 02	0.511E-01	177.58	177.35
15	15.43	13.81	535.65	535.90	0.473E 02	0.591E-01	177.59	177.31
16	15.43	13.81	535.65	535.90	0.473E 02	0.591E-01	177.59	177.31
17	15.64	13.85	535.72	535.83	0.527E 02	0.656E-01	177.59	177.48
18	15.64	13.86	535.75	535.90	0.526E 02	0.658E-01	177.60	177.46
19	15.64	13.58	535.82	535.93	0.602E 02	0.860E-01	177.62	177.52
20	16.18	13.58	535.82	536.07	0.775E 02	0.110E 00	177.64	177.46
21	17.13	13.59	535.82	536.00	0.109E 03	0.147E 00	177.63	177.54
22	18.17	13.61	535.82	535.93	0.145E 03	0.196E 00	177.63	177.58
23	19.66	13.63	535.82	536.00	0.201E 03	0.259E 00	177.64	177.58
24	20.66	13.64	535.86	536.04	0.241E 03	0.302E 00	177.66	177.60
25	21.73	13.67	535.86	536.07	0.286E 03	0.359E 00	177.67	177.61
26	22.66	13.69	535.86	536.07	0.326E 03	0.407E 00	177.67	177.62
27	23.61	13.71	535.89	536.07	0.369E 03	0.452E 00	177.68	177.64
28	25.77	13.77	535.93	536.07	0.475E 03	0.571E 00	177.70	177.67
29	27.86	13.83	535.93	536.04	0.585E 03	0.690E 00	177.70	177.69
30	29.93	13.90	535.93	536.00	0.702E 03	0.819E 00	177.71	177.70
31	31.87	13.98	535.93	536.04	0.820E 03	0.939E 00	177.72	177.71
32	33.92	14.06	535.93	536.07	0.953E 03	0.107E 01	177.74	177.72
33	36.03	14.15	535.93	536.07	0.110E 04	0.121E 01	177.75	177.74
34	38.03	14.24	535.96	536.11	0.124E 04	0.135E 01	177.76	177.76
35	40.22	14.36	536.00	536.11	0.141E 04	0.152E 01	177.78	177.78
36	24.79	13.69	532.94	533.19	0.427E 03	0.527E 00	176.97	176.91
37	26.78	13.75	533.08	533.33	0.528E 03	0.636E 00	177.01	176.96
38	28.80	13.82	533.22	533.47	0.639E 03	0.760E 00	177.05	177.01
39	30.77	13.88	533.43	533.68	0.754E 03	0.874E 00	177.11	177.08
40	32.91	13.97	533.60	533.85	0.888E 03	0.102E 01	177.17	177.14
41	35.11	14.06	533.78	534.02	0.103E 04	0.117E 01	177.22	177.19
42	36.94	14.15	533.95	534.20	0.116E 04	0.129E 01	177.27	177.25

TABLE 11 EXPERIMENTAL GAS FLOW DATA FOR CORE 3
(CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
43	39.11	14.24	534.09	534.34	0.133E 04	0.144E 01	177.32	177.30
44	41.99	14.41	535.72	535.86	0.156E 04	0.167E 01	177.72	177.72
45	43.59	14.48	535.82	535.93	0.169E 04	0.177E 01	177.75	177.76
46	47.19	14.72	535.96	536.00	0.201E 04	0.206E 01	177.80	177.82
47	49.84	14.93	535.96	536.07	0.226E 04	0.230E 01	177.82	177.83
48	52.84	15.11	536.14	536.21	0.256E 04	0.255E 01	177.87	177.90
49	56.09	15.38	536.17	536.28	0.291E 04	0.284E 01	177.90	177.93
50	56.09	15.12	536.27	536.28	0.292E 04	0.289E 01	177.92	177.95
51	66.09	15.87	536.38	536.42	0.412E 04	0.386E 01	178.00	178.04
52	76.99	17.18	536.45	536.42	0.563E 04	0.500E 01	178.07	178.13
53	82.99	18.01	536.55	536.45	0.656E 04	0.569E 01	178.12	178.20
54	96.84	20.30	536.66	536.49	0.897E 04	0.727E 01	178.21	178.32
55	117.79	24.61	536.83	536.42	0.133E 05	0.996E 01	178.35	178.51
56	129.64	27.41	536.93	536.42	0.161E 05	0.115E 02	178.44	178.63
57	146.14	31.59	537.11	536.35	0.204E 05	0.139E 02	178.56	178.79
58	155.74	34.40	537.25	536.28	0.231E 05	0.153E 02	178.63	178.90
59	170.19	39.20	537.38	536.31	0.274E 05	0.175E 02	178.75	179.05
60	177.39	41.88	537.70	536.25	0.297E 05	0.185E 02	178.83	179.19
61	177.39	41.81	537.73	536.14	0.297E 05	0.181E 02	178.82	179.20
62	155.06	35.38	537.97	537.29	0.228E 05	0.150E 02	178.85	179.08
63	234.27	72.87	538.08	537.04	0.496E 05	0.269E 02	179.44	179.76
63	261.00	84.52	538.04	536.83	0.610E 05	0.315E 02	179.62	179.98
64	310.50	106.52	538.67	536.59	0.851E 05	0.398E 02	180.06	180.59
65	361.19	133.27	538.98	536.35	0.113E 06	0.485E 02	180.51	181.16
66	409.31	157.02	539.36	536.18	0.143E 06	0.579E 02	180.95	181.73
67	448.22	176.77	539.74	535.90	0.170E 06	0.652E 02	181.31	182.23
68	434.26	170.12	540.02	535.90	0.160E 06	0.626E 02	181.22	182.18
69	381.49	144.32	540.02	535.72	0.125E 06	0.528E 02	180.74	181.69
70	337.23	122.77	540.05	535.86	0.987E 05	0.445E 02	180.39	181.29
71	273.57	93.12	540.02	535.90	0.662E 05	0.334E 02	179.87	180.70
72	239.51	77.82	539.81	536.07	0.513E 05	0.276E 02	179.60	180.33
73	210.20	66.07	539.74	536.11	0.398E 05	0.231E 02	179.37	180.07
74	186.83	56.22	536.21	536.25	0.317E 05	0.193E 02	178.77	178.89
75	186.83	56.37	539.46	536.42	0.317E 05	0.197E 02	179.20	179.79
76	117.52	26.41	538.42	537.32	0.130E 05	0.987E 01	178.69	178.93
78	165.15	47.01	538.26	537.25	0.251E 05	0.163E 02	179.00	179.27
79	193.46	58.96	538.39	537.18	0.340E 05	0.206E 02	179.21	179.52
80	293.27	101.46	538.77	537.11	0.757E 05	0.365E 02	180.02	180.47
81	379.40	141.01	539.19	536.87	0.124E 06	0.522E 02	180.75	181.36
82	473.66	189.26	536.24	536.73	0.189E 06	0.701E 02	181.20	181.38

TABLE 11 EXPERIMENTAL GAS FLOW DATA FOR CORE 3 (CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
83	566.93	237.16	540.15	536.35	0.265E 06	0.884E 02	182.51	183.51
84	606.53	258.41	540.54	535.97	0.301E 06	0.967E 02	182.90	184.06
85	531.48	218.91	540.67	535.72	0.235E 06	0.821E 02	182.17	183.35
86	434.25	168.41	540.64	535.86	0.160E 06	0.628E 02	181.29	182.36
87	315.54	110.91	540.54	535.97	0.873E 05	0.407E 02	180.27	181.21
88	240.98	77.01	540.33	536.21	0.521E 05	0.277E 02	179.68	180.48
89	14.20	14.15	536.83	536.97	0.130E 01	0.165E-02	177.87	172.49
90	14.20	14.16	536.83	537.01	0.131E 01	0.164E-02	177.87	171.29
91	14.20	14.16	536.83	537.01	0.131E 01	0.164E-02	177.87	171.29
92	14.20	14.16	537.00	537.15	0.133E 01	0.165E-02	177.91	172.64
93	14.29	14.07	537.18	537.35	0.630E 01	0.813E-02	177.96	176.55
94	14.29	14.07	537.18	537.35	0.630E 01	0.807E-02	177.96	176.55
95	14.29	14.07	537.18	537.35	0.630E 01	0.807E-02	177.96	176.55
96	14.38	14.05	537.31	537.46	0.952E 01	0.122E-01	177.99	177.23
97	14.39	14.05	537.31	537.46	0.955E 01	0.124E-01	177.99	177.24
98	14.39	14.05	537.38	537.53	0.965E 01	0.123E-01	178.00	177.26
99	14.39	14.05	537.38	537.53	0.965E 01	0.122E-01	178.00	177.26
100	13.56	13.43	535.20	535.52	0.348E 01	0.451E-02	177.48	173.46
103	14.14	14.07	535.69	535.86	0.200E 01	0.255E-02	177.59	173.30
104	14.17	14.03	535.72	535.97	0.402E 01	0.515E-02	177.60	174.62
106	14.25	13.97	535.79	535.97	0.791E 01	0.994E-02	177.61	176.51
107	14.25	13.96	535.72	536.04	0.810E 01	0.102E-01	177.61	175.70
108	14.25	13.96	535.79	536.00	0.804E 01	0.101E-01	177.62	176.32
109	14.29	13.93	535.48	535.55	0.102E 02	0.135E-01	177.52	177.16
110	14.33	13.89	535.34	535.59	0.122E 02	0.157E-01	177.51	176.51
111	14.36	13.86	535.37	535.55	0.143E 02	0.182E-01	177.51	176.89
112	14.40	13.82	535.58	535.76	0.163E 02	0.209E-01	177.56	177.02
113	14.44	13.79	535.65	535.83	0.183E 02	0.236E-01	177.58	177.10
114	14.47	13.75	535.65	535.90	0.204E 02	0.263E-01	177.59	176.99
116	98.52	19.34	535.13	535.45	0.933E 04	0.749E 01	177.90	177.94
117	110.97	21.54	535.20	535.34	0.118E 05	0.905E 01	177.96	178.05
118	125.27	24.52	535.34	535.38	0.151E 05	0.110E 02	178.07	178.18
119	131.77	25.95	535.41	535.38	0.167E 05	0.119E 02	178.12	178.25
120	139.81	27.87	535.44	535.38	0.188E 05	0.130E 02	178.17	178.31
121	149.31	30.21	535.62	535.38	0.214E 05	0.144E 02	178.26	178.43
122	157.71	32.33	535.69	535.38	0.238E 05	0.156E 02	178.32	178.50
123	165.26	34.47	535.96	535.41	0.261E 05	0.168E 02	178.41	178.63
124	173.81	36.91	536.07	535.52	0.288E 05	0.181E 02	178.49	178.72
125	176.51	41.12	536.17	535.41	0.295E 05	0.184E 02	178.52	178.78
126	182.97	43.72	536.41	535.52	0.316E 05	0.193E 02	178.61	178.89

TABLE 11 EXPERIMENTAL GAS FLOW DATA FOR CORE 3
(CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
127	188.72	45.97	536.52	535.52	0.335E 05	0.203E 02	178.67	178.97
128	196.73	48.62	536.66	535.52	0.363E 05	0.215E 02	178.74	179.07
129	196.73	48.47	536.66	535.52	0.364E 05	0.210E 02	178.74	179.07
130	273.17	77.12	537.04	535.55	0.687E 05	0.334E 02	179.35	179.78
131	365.05	108.82	537.56	535.41	0.121E 06	0.510E 02	180.09	180.70
132	391.39	119.22	538.15	535.38	0.139E 06	0.563E 02	180.37	181.09
134	17.90	13.57	540.81	540.58	0.136E 03	0.177E 00	178.83	178.94
135	19.98	13.61	540.95	540.68	0.214E 03	0.269E 00	178.87	178.96
136	21.95	13.65	540.88	540.72	0.295E 03	0.363E 00	178.87	178.92
137	23.54	13.69	541.02	540.75	0.367E 03	0.436E 00	178.90	178.97
138	25.87	13.75	541.12	540.92	0.480E 03	0.570E 00	178.95	179.00
139	28.04	13.81	541.09	540.92	0.596E 03	0.695E 00	178.95	179.00
140	30.17	13.89	541.19	540.96	0.717E 03	0.821E 00	178.98	179.04
141	31.93	13.95	541.12	540.99	0.825E 03	0.929E 00	178.99	179.02
142	34.40	14.06	541.12	540.96	0.986E 03	0.109E 01	179.00	179.04
143	36.70	14.18	541.19	540.99	0.115E 04	0.124E 01	179.02	179.07
144	38.50	14.28	541.26	541.06	0.128E 04	0.138E 01	179.05	179.10
145	40.17	14.38	541.33	541.10	0.141E 04	0.150E 01	179.07	179.13
146	43.61	14.60	541.33	541.13	0.169E 04	0.175E 01	179.09	179.15
147	47.51	14.89	541.43	541.27	0.204E 04	0.206E 01	179.14	179.20
148	50.41	15.14	541.54	541.27	0.231E 04	0.229E 01	179.17	179.24
149	54.06	15.52	541.54	541.27	0.268E 04	0.261E 01	179.19	179.27
150	57.66	15.90	541.54	541.30	0.307E 04	0.292E 01	179.22	179.29
151	57.66	15.43	541.57	541.34	0.309E 04	0.296E 01	179.22	179.30
152	69.01	16.70	541.54	541.30	0.448E 04	0.408E 01	179.28	179.36
153	76.46	17.75	541.47	541.27	0.553E 04	0.488E 01	179.31	179.40
154	94.26	20.86	541.47	541.23	0.845E 04	0.685E 01	179.41	179.52
155	115.01	25.51	541.54	541.23	0.126E 05	0.941E 01	179.54	179.69
156	132.76	30.23	541.54	541.13	0.167E 05	0.118E 02	179.65	179.82
157	161.56	38.84	541.61	541.10	0.246E 05	0.159E 02	179.84	180.05
158	180.93	44.65	541.78	541.06	0.307E 05	0.187E 02	179.99	180.24
159	197.86	54.40	541.85	540.99	0.362E 05	0.211E 02	180.13	180.41
160	197.86	54.40	541.85	540.99	0.362E 05	0.209E 02	180.13	180.41
161	294.89	94.75	542.06	540.85	0.780E 05	0.367E 02	180.89	181.27
162	425.68	154.55	542.44	540.61	0.157E 06	0.616E 02	181.99	182.55
163	571.92	235.40	542.64	540.40	0.272E 06	0.901E 02	183.36	184.07
164	495.68	197.40	542.71	540.16	0.207E 06	0.747E 02	182.63	183.36
165	393.29	145.99	542.61	540.06	0.133E 06	0.545E 02	181.70	182.36
166	354.18	126.94	542.58	540.02	0.109E 06	0.475E 02	181.36	182.00
167	14.13	13.58	542.71	541.10	0.152E 02	0.183E-01	179.11	184.38

TABLE 11 EXPERIMENTAL GAS FLOW DATA FOR CORE 3
(CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
169	14.47	13.60	543.47	543.27	0.244E 02	0.309E-01	179.48	179.89
170	14.98	13.69	543.61	543.38	0.371E 02	0.464E-01	179.51	179.84
171	15.37	14.05	543.65	543.41	0.387E 02	0.489E-01	179.53	179.86
172	17.67	16.59	543.61	543.41	0.370E 02	0.455E-01	179.55	179.94
173	19.65	18.34	543.61	543.45	0.499E 02	0.619E-01	179.57	179.87
174	21.68	20.79	543.40	543.45	0.379E 02	0.466E-01	179.56	179.44
176	25.69	24.64	543.96	543.86	0.428E 02	0.486E-01	179.73	180.08
177	27.73	26.74	544.13	544.04	0.539E 02	0.598E-01	179.79	180.12
178	29.88	29.04	544.20	544.14	0.494E 02	0.571E-01	179.83	180.10
179	31.92	31.25	544.30	544.28	0.427E 02	0.462E-01	179.89	180.04
180	33.91	33.20	544.37	544.38	0.483E 02	0.543E-01	179.93	179.88
181	15.13	13.67	537.87	536.56	0.420E 02	0.530E-01	177.95	179.57
189	15.13	13.67	537.87	536.56	0.421E 02	0.530E-01	177.95	179.57
182	15.13	14.11	537.77	536.66	0.300E 02	0.378E-01	177.95	179.93
190	15.13	14.10	537.77	536.66	0.301E 02	0.378E-01	177.95	179.92
183	20.41	20.17	538.87	537.18	0.993E 01	0.129E-01	178.20	197.57
184	23.82	23.47	539.12	537.32	0.166E 02	0.216E-01	178.28	194.80
185	28.32	27.99	539.15	537.39	0.186E 02	0.229E-01	178.34	199.26
186	28.12	27.94	538.87	536.94	0.102E 02	0.125E-01	178.25	225.42
187	31.02	30.75	538.91	537.08	0.172E 02	0.211E-01	178.30	207.87
188	34.58	34.39	539.22	537.42	0.128E 02	0.154E-01	178.42	232.66
200	13.57	13.36	538.60	537.11	0.562E 01	0.737E-02	178.10	190.87
213	13.57	13.36	538.60	537.11	0.564E 01	0.737E-02	178.10	190.81
201	13.80	13.34	538.77	537.39	0.124E 02	0.156E-01	178.15	183.39
214	13.80	13.36	538.77	537.39	0.121E 02	0.156E-01	178.15	183.57
202	13.87	13.61	539.32	537.91	0.724E 01	0.920E-02	178.29	187.97
215	13.87	13.60	539.32	537.91	0.734E 01	0.920E-02	178.29	187.83
203	14.58	13.41	539.74	538.36	0.329E 02	0.417E-01	178.40	180.47
216	14.58	13.41	539.74	538.36	0.329E 02	0.417E-01	178.40	180.48
204	14.63	14.41	539.91	538.50	0.625E 01	0.811E-02	178.44	191.19
217	14.63	14.41	539.91	538.50	0.627E 01	0.811E-02	178.44	191.13
218	14.99	14.68	540.22	538.88	0.921E 01	0.116E-01	178.53	186.93
206	15.78	14.84	540.50	539.19	0.287E 02	0.358E-01	178.61	181.33
219	15.78	14.84	540.50	539.19	0.286E 02	0.358E-01	178.61	181.33
207	15.79	15.71	539.81	538.46	0.259E 01	0.336E-02	178.44	217.62
208	17.70	17.39	540.05	538.78	0.110E 02	0.138E-01	178.52	187.87
221	17.70	17.40	540.05	538.78	0.106E 02	0.138E-01	178.52	188.24
209	19.78	19.56	540.19	538.85	0.885E 01	0.111E-01	178.57	194.55
222	19.78	19.55	540.19	538.85	0.904E 01	0.111E-01	178.57	194.19
210	22.11	21.70	540.50	539.19	0.180E 02	0.228E-01	178.67	187.85

TABLE 11 EXPERIMENTAL GAS FLOW DATA FOR CORE 3 (CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
223	24.95	24.68	540.50	539.23	0.131E 02	0.164E-01	178.71	195.05
212	27.18	26.79	540.50	539.33	0.211E 02	0.253E-01	178.74	189.44
224	27.18	26.80	540.50	539.33	0.206E 02	0.253E-01	178.74	189.74
225	13.62	13.43	541.61	541.93	0.531E 01	0.665E-02	179.07	176.36
241	13.62	13.44	541.61	541.93	0.505E 01	0.665E-02	179.07	176.23
226	13.80	13.39	541.92	542.27	0.112E 02	0.141E-01	179.16	177.71
227	14.06	13.43	542.06	542.38	0.173E 02	0.219E-01	179.19	178.32
243	14.06	13.44	542.06	542.38	0.170E 02	0.219E-01	179.19	178.30
228	14.28	13.43	542.33	542.34	0.234E 02	0.295E-01	179.22	179.20
244	14.28	13.44	542.33	542.34	0.232E 02	0.295E-01	179.22	179.20
229	14.50	13.43	542.40	542.65	0.299E 02	0.375E-01	179.27	178.86
245	14.50	13.44	542.40	542.65	0.297E 02	0.375E-01	179.27	178.86
230	14.73	13.43	542.26	542.65	0.363E 02	0.451E-01	179.25	178.72
246	14.73	13.44	542.26	542.65	0.361E 02	0.451E-01	179.25	178.72
247	13.72	13.45	539.53	539.85	0.719E 01	0.927E-02	178.55	176.54
232	14.01	13.45	539.70	540.06	0.152E 02	0.194E-01	178.60	177.52
248	13.64	13.46	540.36	540.75	0.496E 01	0.640E-02	178.77	175.25
234	13.86	13.46	540.40	540.78	0.107E 02	0.136E-01	178.78	177.10
249	13.86	13.47	540.40	540.78	0.106E 02	0.136E-01	178.78	177.09
235	14.08	13.47	540.57	540.92	0.167E 02	0.213E-01	178.82	177.82
250	14.08	13.48	540.57	540.92	0.167E 02	0.213E-01	178.82	177.82
236	14.30	13.48	540.54	540.92	0.228E 02	0.287E-01	178.82	178.00
251	14.30	13.48	540.54	540.92	0.228E 02	0.287E-01	178.82	178.00
252	14.31	14.15	540.95	541.27	0.452E 01	0.576E-02	178.91	175.41
238	14.52	14.35	540.98	541.41	0.485E 01	0.608E-02	178.94	174.51
253	14.52	14.36	540.98	541.41	0.460E 01	0.608E-02	178.94	174.28
239	14.74	14.51	541.02	541.30	0.665E 01	0.834E-02	178.93	176.68
254	14.74	14.51	541.02	541.30	0.659E 01	0.834E-02	178.93	176.66
240	14.96	14.83	541.23	541.65	0.377E 01	0.478E-02	179.00	172.99
255	14.96	14.83	541.23	541.65	0.372E 01	0.478E-02	179.00	172.91
256	14.83	14.72	540.71	541.05	0.331E 01	0.444E-02	178.86	173.22
257	21.70	13.64	541.33	541.75	0.285E 03	0.347E 00	179.06	178.94
258	24.63	13.74	539.29	539.54	0.418E 03	0.499E 00	178.54	178.49
259	26.66	13.81	538.67	539.02	0.520E 03	0.611E 00	178.41	178.34
260	28.70	13.88	537.73	537.98	0.631E 03	0.728E 00	178.17	178.13
261	32.11	14.04	536.41	536.80	0.834E 03	0.941E 00	177.88	177.82
262	24.14	13.71	540.85	541.06	0.395E 03	0.470E 00	178.92	178.87
263	25.69	13.76	540.88	541.27	0.471E 03	0.555E 00	178.96	178.88
264	27.69	13.82	541.05	541.44	0.576E 03	0.667E 00	179.01	178.94
265	30.19	13.92	540.50	541.10	0.717E 03	0.816E 00	178.91	178.81

TABLE 11 EXPERIMENTAL GAS FLOW DATA FOR CORE 3 (CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
266	30.88	13.94	539.95	540.37	0.759E 03	0.853E 00	178.76	178.69
267	33.09	14.19	536.03	536.52	0.894E 03	0.990E 00	177.80	177.73
268	33.12	14.19	536.34	536.73	0.895E 03	0.996E 00	177.87	177.81
269	34.14	14.25	536.31	536.94	0.963E 03	0.107E 01	177.89	177.79
270	36.28	14.36	536.86	537.39	0.111E 04	0.121E 01	178.03	177.95
271	38.57	14.47	536.97	537.46	0.128E 04	0.137E 01	178.06	178.00
272	40.48	14.58	537.11	537.63	0.143E 04	0.152E 01	178.11	178.05
273	42.33	14.70	537.14	537.70	0.158E 04	0.166E 01	178.13	178.07
274	44.23	14.87	537.28	537.74	0.174E 04	0.180E 01	178.16	178.12
275	46.33	14.98	537.35	537.81	0.192E 04	0.197E 01	178.19	178.15
276	48.33	15.13	537.49	537.94	0.211E 04	0.214E 01	178.24	178.20
277	49.67	15.22	537.38	537.94	0.224E 04	0.224E 01	178.23	178.18
278	51.52	15.37	537.38	537.63	0.242E 04	0.240E 01	178.20	178.20
279	52.92	15.50	537.35	537.81	0.256E 04	0.252E 01	178.23	178.19
280	54.71	15.67	537.49	537.91	0.275E 04	0.267E 01	178.27	178.24
281	56.51	15.83	537.45	538.08	0.294E 04	0.283E 01	178.29	178.24
282	58.06	15.99	537.56	538.05	0.312E 04	0.297E 01	178.31	178.28
283	61.21	16.31	537.59	538.01	0.348E 04	0.325E 01	178.33	178.31
284	62.76	16.51	537.56	538.15	0.367E 04	0.341E 01	178.35	178.31
285	63.06	16.03	537.56	538.01	0.372E 04	0.349E 01	178.33	178.31
286	61.44	15.27	535.89	536.25	0.354E 04	0.336E 01	177.89	177.89
287	69.19	15.97	535.82	536.31	0.453E 04	0.419E 01	177.93	177.92
288	78.04	16.90	536.03	536.38	0.580E 04	0.510E 01	178.01	178.03
289	88.44	18.24	535.89	536.31	0.749E 04	0.627E 01	178.05	178.07
290	95.40	19.32	536.24	536.63	0.873E 04	0.705E 01	178.17	178.20
291	55.67	15.11	535.48	535.72	0.287E 04	0.285E 01	177.75	177.75
292	75.66	16.93	535.69	535.62	0.544E 04	0.478E 01	177.86	177.93
293	99.26	20.62	535.96	536.07	0.943E 04	0.754E 01	178.09	178.16
294	106.31	21.90	536.10	536.11	0.108E 05	0.843E 01	178.15	178.25
295	110.11	22.33	536.31	536.25	0.116E 05	0.893E 01	178.22	178.32
296	117.56	23.91	536.59	536.45	0.132E 05	0.991E 01	178.32	178.45
298	128.91	26.51	536.93	536.59	0.159E 05	0.114E 02	178.45	178.62
299	134.00	27.75	537.11	536.70	0.172E 05	0.121E 02	178.52	178.70
300	139.10	29.08	537.21	536.59	0.185E 05	0.129E 02	178.55	178.76
301	144.85	30.57	537.07	536.80	0.200E 05	0.137E 02	178.60	178.77
302	149.40	31.79	537.35	536.83	0.213E 05	0.144E 02	178.67	178.87
303	157.75	34.12	537.28	536.83	0.237E 05	0.156E 02	178.71	178.91
304	162.59	35.58	537.35	536.83	0.252E 05	0.163E 02	178.75	178.97
305	169.39	37.52	537.38	536.83	0.273E 05	0.174E 02	178.80	179.03
306	178.69	39.89	537.56	536.90	0.303E 05	0.185E 02	178.89	179.14

TABLE 11 EXPERIMENTAL GAS FLOW DATA FOR CORE 3
(CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
307	185.72	42.04	537.59	536.94	0.327E 05	0.196E 02	178.95	179.20
308	193.14	49.14	537.73	536.94	0.349E 05	0.207E 02	179.04	179.31
309	197.89	50.78	537.77	537.01	0.366E 05	0.215E 02	179.09	179.36
310	203.63	52.88	537.80	537.08	0.387E 05	0.223E 02	179.14	179.41
311	208.78	54.78	537.94	537.15	0.406E 05	0.232E 02	179.21	179.49
313	31.80	13.93	537.04	537.29	0.817E 03	0.928E 00	178.01	177.98
314	33.98	14.02	537.56	537.84	0.958E 03	0.107E 01	178.16	178.12
315	32.70	14.14	538.11	538.36	0.869E 03	0.981E 00	178.29	178.25
316	34.76	14.26	538.28	538.57	0.100E 04	0.112E 01	178.34	178.31
317	36.47	14.37	538.46	538.71	0.112E 04	0.123E 01	178.39	178.37
318	37.74	14.44	538.60	538.88	0.122E 04	0.123E 01	178.44	178.41
319	39.70	14.57	540.47	540.72	0.136E 04	0.146E 01	178.91	178.89
320	41.30	14.68	538.98	539.30	0.149E 04	0.159E 01	178.56	178.53
321	43.64	14.86	539.12	539.40	0.168E 04	0.176E 01	178.60	178.58
322	46.34	15.08	539.22	539.47	0.192E 04	0.197E 01	178.63	178.62
323	48.84	15.29	539.22	539.47	0.215E 04	0.217E 01	178.65	178.64
324	51.38	15.53	539.32	539.50	0.240E 04	0.238E 01	178.68	178.68
325	53.53	15.74	539.32	539.54	0.262E 04	0.256E 01	178.69	178.70
326	55.63	15.97	539.29	539.54	0.284E 04	0.275E 01	178.70	178.70
327	57.48	16.17	539.25	539.50	0.304E 04	0.291E 01	178.70	178.71
328	61.83	16.72	539.22	539.47	0.354E 04	0.332E 01	178.72	178.73
329	61.88	16.25	539.22	539.47	0.357E 04	0.339E 01	178.72	178.73
330	54.45	14.80	536.31	536.59	0.275E 04	0.271E 01	177.95	177.95
331	66.45	15.74	536.52	536.73	0.417E 04	0.392E 01	178.06	178.08
332	77.21	16.89	536.69	536.94	0.568E 04	0.500E 01	178.16	178.19
333	86.71	18.13	536.86	537.01	0.719E 04	0.609E 01	178.25	178.30
334	96.87	19.77	536.83	537.08	0.899E 04	0.728E 01	178.31	178.35
335	110.93	22.37	537.00	537.11	0.118E 05	0.903E 01	178.42	178.50
336	115.79	23.08	537.14	537.29	0.129E 05	0.968E 01	178.48	178.57
337	124.25	24.90	537.18	537.18	0.148E 05	0.108E 02	178.53	178.64
338	132.40	26.85	537.14	537.29	0.168E 05	0.119E 02	178.59	178.69
339	141.30	29.05	537.21	537.15	0.191E 05	0.132E 02	178.63	178.77
340	149.95	30.35	537.28	537.29	0.216E 05	0.145E 02	178.71	178.85
341	155.85	31.78	537.28	537.11	0.233E 05	0.154E 02	178.73	178.89
342	163.41	33.85	537.31	537.25	0.256E 05	0.165E 02	178.80	178.96
343	168.66	35.30	537.38	537.25	0.272E 05	0.173E 02	178.84	179.01
344	177.26	40.69	537.35	537.29	0.298E 05	0.184E 02	178.91	179.07
345	183.18	42.67	537.52	537.29	0.317E 05	0.193E 02	178.98	179.16
346	191.00	45.37	537.52	537.29	0.344E 05	0.205E 02	179.03	179.22
347	197.74	47.73	537.56	537.29	0.368E 05	0.215E 02	179.08	179.29

TABLE 11 EXPERIMENTAL GAS FLOW DATA FOR CORE 3
(CONTINUED)

RUN	PC1 (PSIA)	PC2 (PSIA)	RT1 (R)	RT2 (R)	DIFPS (PSIA2)	QSC (SCFH)	VX (MMP)	VIAV (MMP)
348	204.77	50.38	537.56	537.29	0.394E 05	0.227E 02	179.13	179.34
349	207.15	51.03	537.63	537.35	0.403E 05	0.215E 02	179.17	179.38
351	70.55	15.91	534.78	534.96	0.472E 04	0.438E 01	177.64	177.67
352	75.44	16.39	534.92	535.00	0.542E 04	0.489E 01	177.69	177.74
353	86.79	17.77	534.99	535.13	0.722E 04	0.614E 01	177.78	177.83
354	96.33	19.18	535.10	535.07	0.891E 04	0.732E 01	177.83	177.92
355	107.28	21.07	535.13	535.17	0.111E 05	0.869E 01	177.91	178.01
356	116.73	22.91	535.23	535.07	0.131E 05	0.993E 01	177.97	178.10
357	127.27	25.14	535.30	535.17	0.156E 05	0.114E 02	178.05	178.19
358	134.27	26.75	535.37	535.20	0.173E 05	0.124E 02	178.11	178.26
359	141.67	28.58	535.48	535.27	0.193E 05	0.135E 02	178.18	178.34
360	144.62	29.01	535.51	535.34	0.201E 05	0.139E 02	178.21	178.36
361	151.82	30.85	535.62	535.34	0.221E 05	0.150E 02	178.27	178.44
362	158.57	32.59	535.58	535.13	0.241E 05	0.160E 02	178.28	178.49
363	167.57	37.66	535.58	535.24	0.267E 05	0.173E 02	178.36	178.56
364	174.11	39.42	535.51	535.13	0.288E 05	0.181E 02	178.38	178.59
365	182.13	42.27	535.62	535.34	0.314E 05	0.194E 02	178.48	178.67
366	191.14	45.42	535.69	535.34	0.345E 05	0.209E 02	178.55	178.76
367	200.55	49.02	535.75	535.34	0.378E 05	0.225E 02	178.63	178.85
368	200.75	48.97	535.75	535.24	0.379E 05	0.225E 02	178.62	178.86

TABLE 12 APPARENT GAS PERMEABILITY RESULTS FOR CORE 3

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
1	0.99982	0.4373E 01	0.2686E 02	0.07291	0.2686E 02	0.2680E 02
2	0.99981	0.1180E 02	0.2646E 02	0.07190	0.2646E 02	0.2638E 02
3	0.99981	0.1182E 02	0.2643E 02	0.07190	0.2643E 02	0.2635E 02
6	0.99980	0.2083E 02	0.2643E 02	0.07059	0.2643E 02	0.2639E 02
7	0.99980	0.2080E 02	0.2650E 02	0.07058	0.2650E 02	0.2647E 02
8	0.99980	0.2582E 02	0.2616E 02	0.06989	0.2616E 02	0.2610E 02
9	0.99980	0.2589E 02	0.2629E 02	0.06987	0.2629E 02	0.2624E 02
10	0.99980	0.2593E 02	0.2636E 02	0.06988	0.2636E 02	0.2634E 02
11	0.99980	0.3048E 02	0.2635E 02	0.06924	0.2635E 02	0.2633E 02
12	0.99980	0.3048E 02	0.2640E 02	0.06923	0.2640E 02	0.2637E 02
13	0.99980	0.3672E 02	0.2611E 02	0.06891	0.2611E 02	0.2608E 02
14	0.99980	0.3685E 02	0.2623E 02	0.06892	0.2623E 02	0.2620E 02
15	0.99980	0.4230E 02	0.2615E 02	0.06840	0.2615E 02	0.2611E 02
16	0.99980	0.4236E 02	0.2621E 02	0.06840	0.2621E 02	0.2617E 02
17	0.99980	0.4657E 02	0.2607E 02	0.06780	0.2607E 02	0.2605E 02
18	0.99980	0.4671E 02	0.2618E 02	0.06780	0.2618E 02	0.2616E 02
19	0.99980	0.6167E 02	0.2995E 02	0.06846	0.2995E 02	0.2993E 02
20	0.99980	0.7777E 02	0.2988E 02	0.06719	0.2988E 02	0.2985E 02
21	0.99979	0.1003E 03	0.2833E 02	0.06509	0.2833E 02	0.2832E 02
22	0.99978	0.1291E 03	0.2829E 02	0.06294	0.2830E 02	0.2829E 02
23	0.99977	0.1633E 03	0.2708E 02	0.06009	0.2708E 02	0.2707E 02
24	0.99977	0.1844E 03	0.2627E 02	0.05830	0.2627E 02	0.2627E 02
25	0.99976	0.2126E 03	0.2635E 02	0.05650	0.2635E 02	0.2635E 02
26	0.99975	0.2347E 03	0.2616E 02	0.05502	0.2616E 02	0.2615E 02
27	0.99975	0.2539E 03	0.2566E 02	0.05360	0.2565E 02	0.2565E 02
28	0.99973	0.3029E 03	0.2523E 02	0.05058	0.2523E 02	0.2523E 02
29	0.99972	0.3468E 03	0.2471E 02	0.04797	0.2471E 02	0.2471E 02
30	0.99970	0.3918E 03	0.2445E 02	0.04563	0.2445E 02	0.2445E 02
31	0.99969	0.4292E 03	0.2399E 02	0.04363	0.2399E 02	0.2399E 02
32	0.99968	0.4670E 03	0.2351E 02	0.04169	0.2351E 02	0.2351E 02
33	0.99966	0.5066E 03	0.2315E 02	0.03985	0.2315E 02	0.2315E 02
34	0.99965	0.5448E 03	0.2291E 02	0.03826	0.2290E 02	0.2290E 02
35	0.99963	0.5836E 03	0.2257E 02	0.03665	0.2257E 02	0.2257E 02
36	0.99972	0.2841E 03	0.2562E 02	0.05193	0.2562E 02	0.2561E 02
37	0.99971	0.3262E 03	0.2502E 02	0.04934	0.2502E 02	0.2501E 02
38	0.99969	0.3706E 03	0.2473E 02	0.04692	0.2473E 02	0.2473E 02
39	0.99968	0.4071E 03	0.2410E 02	0.04479	0.2410E 02	0.2409E 02
40	0.99967	0.4511E 03	0.2383E 02	0.04266	0.2383E 02	0.2382E 02
41	0.99965	0.4937E 03	0.2346E 02	0.04068	0.2346E 02	0.2345E 02
42	0.99964	0.5277E 03	0.2315E 02	0.03915	0.2315E 02	0.2315E 02

TABLE 12 APPARENT GAS PERMEABILITY RESULTS FOR CORE 3
(CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
43	0.99962	0.5639E 03	0.2267E 02	0.03748	0.2267E 02	0.2267E 02
44	0.99962	0.6198E 03	0.2247E 02	0.03546	0.2247E 02	0.2247E 02
45	0.99961	0.6389E 03	0.2195E 02	0.03444	0.2195E 02	0.2195E 02
46	0.99958	0.6979E 03	0.2149E 02	0.03230	0.2149E 02	0.2150E 02
47	0.99956	0.7455E 03	0.2135E 02	0.03088	0.2135E 02	0.2136E 02
48	0.99955	0.7873E 03	0.2087E 02	0.02943	0.2087E 02	0.2087E 02
49	0.99952	0.8343E 03	0.2049E 02	0.02798	0.2049E 02	0.2049E 02
50	0.99953	0.8530E 03	0.2082E 02	0.02809	0.2082E 02	0.2082E 02
51	0.99946	0.9907E 03	0.1973E 02	0.02440	0.1973E 02	0.1973E 02
52	0.99938	0.1117E 04	0.1867E 02	0.02124	0.1867E 02	0.1868E 02
53	0.99934	0.1184E 04	0.1822E 02	0.01980	0.1822E 02	0.1823E 02
54	0.99924	0.1306E 04	0.1706E 02	0.01707	0.1705E 02	0.1707E 02
55	0.99908	0.1472E 04	0.1580E 02	0.01405	0.1579E 02	0.1581E 02
56	0.99900	0.1548E 04	0.1514E 02	0.01274	0.1514E 02	0.1516E 02
57	0.99887	0.1644E 04	0.1435E 02	0.01125	0.1435E 02	0.1437E 02
58	0.99880	0.1698E 04	0.1400E 02	0.01052	0.1399E 02	0.1402E 02
59	0.99869	0.1764E 04	0.1347E 02	0.00955	0.1346E 02	0.1349E 02
60	0.99864	0.1786E 04	0.1318E 02	0.00912	0.1318E 02	0.1321E 02
61	0.99864	0.1746E 04	0.1288E 02	0.00912	0.1288E 02	0.1291E 02
62	0.99883	0.1664E 04	0.1391E 02	0.01050	0.1391E 02	0.1392E 02
63	0.99800	0.1931E 04	0.1094E 02	0.00579	0.1094E 02	0.1096E 02
63	0.99820	0.1858E 04	0.1151E 02	0.00651	0.1151E 02	0.1153E 02
64	0.99767	0.2032E 04	0.9961E 01	0.00480	0.9961E 01	0.9990E 01
65	0.99734	0.2089E 04	0.9165E 01	0.00404	0.9166E 01	0.9199E 01
66	0.99707	0.2182E 04	0.8649E 01	0.00353	0.8650E 01	0.8688E 01
67	0.99686	0.2232E 04	0.8222E 01	0.00320	0.8223E 01	0.8265E 01
68	0.99695	0.2218E 04	0.8397E 01	0.00331	0.8398E 01	0.8443E 01
69	0.99723	0.2143E 04	0.9034E 01	0.00380	0.9035E 01	0.9083E 01
70	0.99751	0.2062E 04	0.9616E 01	0.00435	0.9615E 01	0.9664E 01
71	0.99792	0.1938E 04	0.1074E 02	0.00545	0.1074E 02	0.1079E 02
72	0.99816	0.1849E 04	0.1144E 02	0.00630	0.1144E 02	0.1148E 02
73	0.99837	0.1770E 04	0.1228E 02	0.00724	0.1228E 02	0.1233E 02
74	0.99848	0.1678E 04	0.1284E 02	0.00823	0.1284E 02	0.1285E 02
75	0.99855	0.1720E 04	0.1318E 02	0.00822	0.1318E 02	0.1323E 02
76	0.99909	0.1430E 04	0.1605E 02	0.01370	0.1605E 02	0.1607E 02
78	0.99871	0.1625E 04	0.1376E 02	0.00943	0.1376E 02	0.1378E 02
79	0.99849	0.1728E 04	0.1285E 02	0.00792	0.1285E 02	0.1287E 02
80	0.99779	0.1968E 04	0.1026E 02	0.00507	0.1026E 02	0.1029E 02
81	0.99726	0.2142E 04	0.8964E 01	0.00384	0.8984E 01	0.9015E 01
82	0.99660	0.2257E 04	0.7935E 01	0.00302	0.7935E 01	0.7943E 01

TABLE 12 APPARENT GAS PERMEABILITY RESULTS FOR CORE 3
(CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
83	0.99640	0.2370E 04	0.7187E 01	0.00249	0.7189E 01	0.7229E 01
84	0.99626	0.2414E 04	0.6934E 01	0.00231	0.6937E 01	0.6981E 01
85	0.99652	0.2352E 04	0.7526E 01	0.00267	0.7529E 01	0.7577E 01
86	0.99698	0.2233E 04	0.8399E 01	0.00332	0.8401E 01	0.8451E 01
87	0.99767	0.2034E 04	0.9940E 01	0.00469	0.9941E 01	0.9993E 01
88	0.99818	0.1850E 04	0.1128E 02	0.00629	0.1128E 02	0.1133E 02
89	0.99981	0.1223E 01	0.2673E 02	0.07054	0.2674E 02	0.2593E 02
90	0.99981	0.1214E 01	0.2632E 02	0.07053	0.2632E 02	0.2535E 02
91	0.99981	0.1216E 01	0.2638E 02	0.07053	0.2638E 02	0.2540E 02
92	0.99981	0.1222E 01	0.2610E 02	0.07052	0.2610E 02	0.2533E 02
93	0.99981	0.6036E 01	0.2716E 02	0.07051	0.2716E 02	0.2695E 02
94	0.99981	0.5990E 01	0.2696E 02	0.07051	0.2696E 02	0.2674E 02
95	0.99981	0.5990E 01	0.2696E 02	0.07051	0.2696E 02	0.2674E 02
96	0.99981	0.9052E 01	0.2702E 02	0.07035	0.2702E 02	0.2691E 02
97	0.99981	0.9149E 01	0.2697E 02	0.07034	0.2697E 02	0.2685E 02
98	0.99981	0.9094E 01	0.2680E 02	0.07034	0.2680E 02	0.2669E 02
99	0.99981	0.9031E 01	0.2662E 02	0.07034	0.2662E 02	0.2651E 02
100	0.99981	0.3493E 01	0.2708E 02	0.07408	0.2708E 02	0.2647E 02
103	0.99981	0.1892E 01	0.2666E 02	0.07092	0.2666E 02	0.2602E 02
104	0.99981	0.3826E 01	0.2682E 02	0.07092	0.2682E 02	0.2637E 02
106	0.99981	0.7382E 01	0.2634E 02	0.07086	0.2634E 02	0.2617E 02
107	0.99981	0.7592E 01	0.2644E 02	0.07088	0.2644E 02	0.2616E 02
108	0.99981	0.7530E 01	0.2643E 02	0.07089	0.2643E 02	0.2623E 02
109	0.99981	0.9986E 01	0.2766E 02	0.07087	0.2766E 02	0.2761E 02
110	0.99981	0.1167E 02	0.2697E 02	0.07086	0.2697E 02	0.2682E 02
111	0.99981	0.1351E 02	0.2671E 02	0.07087	0.2671E 02	0.2662E 02
112	0.99981	0.1549E 02	0.2684E 02	0.07086	0.2684E 02	0.2676E 02
113	0.99981	0.1750E 02	0.2697E 02	0.07086	0.2698E 02	0.2690E 02
114	0.99981	0.1948E 02	0.2689E 02	0.07086	0.2689E 02	0.2680E 02
115	0.99921	0.1331E 04	0.1681E 02	0.01697	0.1681E 02	0.1682E 02
117	0.99911	0.1431E 04	0.1600E 02	0.01509	0.1600E 02	0.1601E 02
118	0.99901	0.1540E 04	0.1529E 02	0.01335	0.1529E 02	0.1530E 02
119	0.99896	0.1580E 04	0.1494E 02	0.01268	0.1493E 02	0.1494E 02
120	0.99890	0.1630E 04	0.1456E 02	0.01193	0.1456E 02	0.1457E 02
121	0.99883	0.1680E 04	0.1411E 02	0.01114	0.1410E 02	0.1412E 02
122	0.99877	0.1729E 04	0.1379E 02	0.01052	0.1379E 02	0.1380E 02
123	0.99871	0.1766E 04	0.1351E 02	0.01001	0.1351E 02	0.1353E 02
124	0.99855	0.1806E 04	0.1319E 02	0.00949	0.1319E 02	0.1320E 02
125	0.99861	0.1776E 04	0.1312E 02	0.00919	0.1311E 02	0.1313E 02
126	0.99856	0.1794E 04	0.1288E 02	0.00882	0.1288E 02	0.1290E 02

TABLE 12 APPARENT GAS PERMEABILITY RESULTS FOR CORE 3 (CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
127	0.99852	0.1817E 04	0.1273E 02	0.00852	0.1273E 02	0.1275E 02
128	0.99846	0.1849E 04	0.1248E 02	0.00815	0.1248E 02	0.1251E 02
129	0.99846	0.1801E 04	0.1214E 02	0.00816	0.1214E 02	0.1216E 02
130	0.99791	0.2017E 04	0.1029E 02	0.00571	0.1029E 02	0.1031E 02
131	0.99734	0.2285E 04	0.8916E 01	0.00422	0.8916E 01	0.8946E 01
132	0.99720	0.2345E 04	0.8617E 01	0.00392	0.8617E 01	0.8652E 01
134	0.99981	0.1194E 03	0.2758E 02	0.06354	0.2758E 02	0.2760E 02
135	0.99980	0.1703E 03	0.2675E 02	0.05955	0.2675E 02	0.2677E 02
136	0.99979	0.2171E 03	0.2617E 02	0.05619	0.2617E 02	0.2618E 02
137	0.99978	0.2496E 03	0.2532E 02	0.05372	0.2532E 02	0.2533E 02
138	0.99976	0.3068E 03	0.2530E 02	0.05048	0.2530E 02	0.2531E 02
139	0.99975	0.3537E 03	0.2485E 02	0.04779	0.2485E 02	0.2485E 02
140	0.99974	0.3973E 03	0.2440E 02	0.04540	0.2440E 02	0.2441E 02
141	0.99973	0.4318E 03	0.2402E 02	0.04359	0.2402E 02	0.2403E 02
142	0.99971	0.4784E 03	0.2352E 02	0.04127	0.2352E 02	0.2352E 02
143	0.99970	0.5217E 03	0.2316E 02	0.03931	0.2316E 02	0.2317E 02
144	0.99969	0.5557E 03	0.2295E 02	0.03789	0.2295E 02	0.2296E 02
145	0.99968	0.5852E 03	0.2269E 02	0.03666	0.2269E 02	0.2270E 02
146	0.99966	0.6405E 03	0.2207E 02	0.03436	0.2207E 02	0.2208E 02
147	0.99963	0.7033E 03	0.2156E 02	0.03205	0.2156E 02	0.2156E 02
148	0.99962	0.7463E 03	0.2116E 02	0.03051	0.2116E 02	0.2117E 02
149	0.99959	0.8005E 03	0.2077E 02	0.02874	0.2077E 02	0.2078E 02
150	0.99957	0.8483E 03	0.2031E 02	0.02719	0.2031E 02	0.2032E 02
151	0.99957	0.8649E 03	0.2048E 02	0.02736	0.2048E 02	0.2049E 02
152	0.99950	0.1016E 04	0.1943E 02	0.02333	0.1943E 02	0.1944E 02
153	0.99945	0.1105E 04	0.1883E 02	0.02123	0.1883E 02	0.1884E 02
154	0.99934	0.1272E 04	0.1733E 02	0.01737	0.1733E 02	0.1734E 02
155	0.99920	0.1433E 04	0.1601E 02	0.01423	0.1600E 02	0.1602E 02
156	0.99908	0.1549E 04	0.1510E 02	0.01227	0.1510E 02	0.1512E 02
157	0.99889	0.1701E 04	0.1386E 02	0.00998	0.1386E 02	0.1388E 02
158	0.99877	0.1776E 04	0.1303E 02	0.00887	0.1303E 02	0.1305E 02
159	0.99864	0.1797E 04	0.1252E 02	0.00793	0.1252E 02	0.1254E 02
160	0.99864	0.1772E 04	0.1235E 02	0.00793	0.1235E 02	0.1237E 02
161	0.99803	0.2025E 04	0.1012E 02	0.00513	0.1012E 02	0.1014E 02
162	0.99735	0.2299E 04	0.8478E 01	0.00345	0.8479E 01	0.8505E 01
163	0.99679	0.2431E 04	0.7223E 01	0.00248	0.7225E 01	0.7253E 01
164	0.99703	0.2340E 04	0.7846E 01	0.00289	0.7847E 01	0.7878E 01
165	0.99747	0.2182E 04	0.8823E 01	0.00371	0.8824E 01	0.8855E 01
166	0.99767	0.2128E 04	0.9363E 01	0.00416	0.9363E 01	0.9396E 01
167	0.99984	0.1413E 02	0.2574E 02	0.07218	0.2574E 02	0.2650E 02

TABLE 12 APPARENT GAS PERMEABILITY RESULTS FOR CORE 3 (CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
169	0.99984	0.2361E 02	0.2719E 02	0.07126	0.2719E 02	0.2725E 02
170	0.99984	0.3476E 02	0.2690E 02	0.06975	0.2690E 02	0.2694E 02
171	0.99983	0.3566E 02	0.2714E 02	0.06797	0.2714E 02	0.2719E 02
172	0.99981	0.2850E 02	0.2637E 02	0.05838	0.2637E 02	0.2642E 02
173	0.99979	0.3499E 02	0.2661E 02	0.05265	0.2661E 02	0.2665E 02
174	0.99976	0.2357E 02	0.2640E 02	0.04709	0.2640E 02	0.2639E 02
176	0.99972	0.2070E 02	0.2443E 02	0.03958	0.2443E 02	0.2448E 02
177	0.99970	0.2365E 02	0.2390E 02	0.03672	0.2390E 02	0.2395E 02
178	0.99968	0.2086E 02	0.2487E 02	0.03395	0.2487E 02	0.2490E 02
179	0.99966	0.1576E 02	0.2330E 02	0.03166	0.2330E 02	0.2332E 02
180	0.99964	0.1744E 02	0.2424E 02	0.02980	0.2424E 02	0.2424E 02
181	0.99981	0.3875E 02	0.2656E 02	0.06945	0.2656E 02	0.2681E 02
189	0.99981	0.3876E 02	0.2651E 02	0.06946	0.2651E 02	0.2675E 02
182	0.99981	0.2721E 02	0.2656E 02	0.06839	0.2656E 02	0.2686E 02
190	0.99981	0.2722E 02	0.2639E 02	0.06841	0.2639E 02	0.2669E 02
183	0.99974	0.6708E 01	0.2741E 02	0.04928	0.2741E 02	0.3039E 02
184	0.99970	0.9652E 01	0.2758E 02	0.04230	0.2758E 02	0.3014E 02
185	0.99964	0.8597E 01	0.2603E 02	0.03552	0.2604E 02	0.2909E 02
186	0.99964	0.4687E 01	0.2585E 02	0.03567	0.2587E 02	0.3271E 02
187	0.99960	0.7215E 01	0.2594E 02	0.03238	0.2596E 02	0.3026E 02
188	0.99956	0.4726E 01	0.2541E 02	0.02900	0.2543E 02	0.3317E 02
200	0.99983	0.5773E 01	0.2768E 02	0.07429	0.2768E 02	0.2965E 02
213	0.99983	0.5773E 01	0.2754E 02	0.07429	0.2754E 02	0.2951E 02
201	0.99982	0.1211E 02	0.2640E 02	0.07367	0.2640E 02	0.2718E 02
214	0.99982	0.1210E 02	0.2726E 02	0.07363	0.2726E 02	0.2808E 02
202	0.99982	0.7079E 01	0.2686E 02	0.07279	0.2686E 02	0.2832E 02
215	0.99982	0.7080E 01	0.2650E 02	0.07280	0.2650E 02	0.2791E 02
203	0.99982	0.3157E 02	0.2687E 02	0.07146	0.2687E 02	0.2718E 02
216	0.99982	0.3157E 02	0.2690E 02	0.07145	0.2690E 02	0.2721E 02
204	0.99982	0.5915E 01	0.2749E 02	0.06888	0.2749E 02	0.2945E 02
217	0.99982	0.5915E 01	0.2738E 02	0.06888	0.2738E 02	0.2933E 02
218	0.99982	0.8263E 01	0.2662E 02	0.06741	0.2662E 02	0.2788E 02
206	0.99981	0.2483E 02	0.2653E 02	0.06532	0.2653E 02	0.2694E 02
219	0.99981	0.2483E 02	0.2660E 02	0.06531	0.2660E 02	0.2701E 02
207	0.99980	0.2259E 01	0.2748E 02	0.06350	0.2749E 02	0.3352E 02
208	0.99978	0.8355E 01	0.2658E 02	0.05699	0.2658E 02	0.2798E 02
221	0.99978	0.8352E 01	0.2756E 02	0.05697	0.2756E 02	0.2906E 02
209	0.99976	0.6004E 01	0.2668E 02	0.05083	0.2669E 02	0.2903E 02
222	0.99976	0.6005E 01	0.2614E 02	0.05084	0.2615E 02	0.2843E 02
210	0.99973	0.1105E 02	0.2692E 02	0.04566	0.2693E 02	0.2831E 02

TABLE 12 APPARENT GAS PERMEABILITY RESULTS FOR CORE 3 (CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
223	0.99970	0.7005E 01	0.2654E 02	0.04030	0.2655E 02	0.2898E 02
212	0.99967	0.9939E 01	0.2539E 02	0.03706	0.2540E 02	0.2692E 02
224	0.99967	0.9937E 01	0.2606E 02	0.03705	0.2607E 02	0.2767E 02
225	0.99984	0.5247E 01	0.2673E 02	0.07393	0.2673E 02	0.2632E 02
241	0.99984	0.5245E 01	0.2808E 02	0.07391	0.2808E 02	0.2763E 02
226	0.99984	0.1111E 02	0.2691E 02	0.07355	0.2691E 02	0.2669E 02
227	0.99984	0.1703E 02	0.2711E 02	0.07277	0.2711E 02	0.2698E 02
243	0.99984	0.1703E 02	0.2756E 02	0.07274	0.2756E 02	0.2742E 02
228	0.99984	0.2278E 02	0.2698E 02	0.07218	0.2698E 02	0.2698E 02
244	0.99984	0.2278E 02	0.2726E 02	0.07216	0.2725E 02	0.2725E 02
229	0.99984	0.2878E 02	0.2690E 02	0.07160	0.2690E 02	0.2684E 02
245	0.99984	0.2877E 02	0.2703E 02	0.07158	0.2703E 02	0.2697E 02
230	0.99984	0.3432E 02	0.2659E 02	0.07102	0.2659E 02	0.2651E 02
246	0.99984	0.3431E 02	0.2678E 02	0.07100	0.2678E 02	0.2670E 02
247	0.99983	0.7238E 01	0.2735E 02	0.07361	0.2735E 02	0.2705E 02
232	0.99983	0.1503E 02	0.2715E 02	0.07284	0.2715E 02	0.2699E 02
248	0.99983	0.5024E 01	0.2747E 02	0.07379	0.2747E 02	0.2693E 02
234	0.99983	0.1056E 02	0.2697E 02	0.07320	0.2697E 02	0.2672E 02
249	0.99983	0.1055E 02	0.2723E 02	0.07319	0.2723E 02	0.2697E 02
235	0.99983	0.1643E 02	0.2706E 02	0.07259	0.2706E 02	0.2691E 02
250	0.99983	0.1643E 02	0.2717E 02	0.07258	0.2717E 02	0.2701E 02
236	0.99983	0.2201E 02	0.2678E 02	0.07200	0.2678E 02	0.2666E 02
251	0.99983	0.2201E 02	0.2685E 02	0.07199	0.2685E 02	0.2673E 02
252	0.99983	0.4310E 01	0.2715E 02	0.07027	0.2715E 02	0.2662E 02
238	0.99983	0.4488E 01	0.2671E 02	0.06928	0.2671E 02	0.2605E 02
253	0.99983	0.4487E 01	0.2814E 02	0.06926	0.2813E 02	0.2740E 02
239	0.99982	0.6079E 01	0.2674E 02	0.06838	0.2674E 02	0.2640E 02
254	0.99982	0.6079E 01	0.2698E 02	0.06838	0.2698E 02	0.2663E 02
240	0.99982	0.3424E 01	0.2704E 02	0.06715	0.2704E 02	0.2613E 02
255	0.99982	0.3424E 01	0.2741E 02	0.06714	0.2741E 02	0.2648E 02
256	0.99982	0.3198E 01	0.2856E 02	0.06769	0.2856E 02	0.2766E 02
257	0.99979	0.2095E 03	0.2598E 02	0.05660	0.2598E 02	0.2597E 02
258	0.99976	0.2758E 03	0.2534E 02	0.05212	0.2534E 02	0.2533E 02
259	0.99974	0.3193E 03	0.2485E 02	0.04942	0.2485E 02	0.2484E 02
260	0.99972	0.3608E 03	0.2436E 02	0.04697	0.2436E 02	0.2436E 02
261	0.99969	0.4284E 03	0.2371E 02	0.04334	0.2371E 02	0.2370E 02
262	0.99977	0.2646E 03	0.2537E 02	0.05283	0.2537E 02	0.2537E 02
263	0.99976	0.2996E 03	0.2510E 02	0.05070	0.2510E 02	0.2509E 02
264	0.99975	0.3428E 03	0.2472E 02	0.04818	0.2472E 02	0.2471E 02
265	0.99973	0.3941E 03	0.2423E 02	0.04534	0.2423E 02	0.2421E 02

TABLE 12 APPARENT GAS PERMEABILITY RESULTS FOR CORE 3 (CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
266	0.99973	0.4044E 03	0.2367E 02	0.04462	0.2387E 02	0.2386E 02
267	0.99968	0.4394E 03	0.2325E 02	0.04230	0.2324E 02	0.2324E 02
268	0.99966	0.4423E 03	0.2337E 02	0.04227	0.2337E 02	0.2336E 02
269	0.99968	0.4626E 03	0.2325E 02	0.04133	0.2325E 02	0.2324E 02
270	0.99967	0.5033E 03	0.2295E 02	0.03949	0.2295E 02	0.2294E 02
271	0.99965	0.5450E 03	0.2262E 02	0.03770	0.2262E 02	0.2261E 02
272	0.99964	0.5820E 03	0.2247E 02	0.03632	0.2247E 02	0.2246E 02
273	0.99963	0.6121E 03	0.2215E 02	0.03507	0.2215E 02	0.2215E 02
274	0.99962	0.6428E 03	0.2189E 02	0.03384	0.2189E 02	0.2189E 02
275	0.99960	0.6774E 03	0.2161E 02	0.03262	0.2161E 02	0.2160E 02
276	0.99959	0.7103E 03	0.2140E 02	0.03152	0.2140E 02	0.2139E 02
277	0.99958	0.7264E 03	0.2108E 02	0.03082	0.2108E 02	0.2108E 02
278	0.99957	0.7555E 03	0.2090E 02	0.02990	0.2090E 02	0.2090E 02
279	0.99956	0.7758E 03	0.2074E 02	0.02923	0.2074E 02	0.2073E 02
280	0.99955	0.8007E 03	0.2051E 02	0.02842	0.2051E 02	0.2050E 02
281	0.99954	0.8248E 03	0.2027E 02	0.02765	0.2027E 02	0.2026E 02
282	0.99953	0.8456E 03	0.2010E 02	0.02701	0.2010E 02	0.2010E 02
283	0.99950	0.8853E 03	0.1972E 02	0.02580	0.1972E 02	0.1971E 02
284	0.99949	0.9080E 03	0.1963E 02	0.02523	0.1963E 02	0.1963E 02
285	0.99949	0.9305E 03	0.1978E 02	0.02529	0.1978E 02	0.1978E 02
286	0.99949	0.9205E 03	0.1994E 02	0.02607	0.1993E 02	0.1993E 02
287	0.99943	0.1034E 04	0.1942E 02	0.02349	0.1942E 02	0.1942E 02
288	0.99937	0.1129E 04	0.1846E 02	0.02107	0.1846E 02	0.1845E 02
289	0.99930	0.1234E 04	0.1757E 02	0.01875	0.1757E 02	0.1757E 02
290	0.99925	0.1293E 04	0.1699E 02	0.01743	0.1699E 02	0.1699E 02
291	0.99952	0.8430E 03	0.2079E 02	0.02826	0.2078E 02	0.2079E 02
292	0.99938	0.1082E 04	0.1842E 02	0.02160	0.1842E 02	0.1843E 02
293	0.99921	0.1320E 04	0.1679E 02	0.01668	0.1678E 02	0.1679E 02
294	0.99916	0.1381E 04	0.1637E 02	0.01560	0.1636E 02	0.1637E 02
295	0.99914	0.1417E 04	0.1614E 02	0.01510	0.1614E 02	0.1615E 02
296	0.99909	0.1475E 04	0.1575E 02	0.01414	0.1575E 02	0.1576E 02
298	0.99901	0.1550E 04	0.1514E 02	0.01287	0.1514E 02	0.1515E 02
299	0.99897	0.1582E 04	0.1489E 02	0.01236	0.1489E 02	0.1490E 02
300	0.99894	0.1619E 04	0.1472E 02	0.01189	0.1472E 02	0.1474E 02
301	0.99889	0.1648E 04	0.1442E 02	0.01140	0.1442E 02	0.1443E 02
302	0.99886	0.1674E 04	0.1423E 02	0.01104	0.1423E 02	0.1425E 02
303	0.99880	0.1718E 04	0.1390E 02	0.01042	0.1389E 02	0.1391E 02
304	0.99877	0.1741E 04	0.1371E 02	0.01009	0.1371E 02	0.1372E 02
305	0.99872	0.1772E 04	0.1343E 02	0.00967	0.1343E 02	0.1345E 02
306	0.99866	0.1796E 04	0.1294E 02	0.00915	0.1294E 02	0.1295E 02

TABLE 12 APPARENT GAS PERMEABILITY RESULTS FOR CORE 3 (CONTINUED)

RUN	ZX	FQK (MD PSIA)	PERM (MD)	RPAV (1/PSIA)	PERMZ (MD)	PERMI (MD)
307	0.99861	0.1824E 04	0.1269E 02	0.00878	0.1269E 02	0.1271E 02
308	0.99853	0.1808E 04	0.1255E 02	0.00825	0.1255E 02	0.1257E 02
309	0.99850	0.1826E 04	0.1241E 02	0.00804	0.1241E 02	0.1243E 02
310	0.99846	0.1844E 04	0.1223E 02	0.00780	0.1223E 02	0.1225E 02
311	0.99842	0.1863E 04	0.1210E 02	0.00759	0.1210E 02	0.1212E 02
313	0.99970	0.4271E 03	0.2389E 02	0.04373	0.2389E 02	0.2389E 02
314	0.99969	0.4697E 03	0.2353E 02	0.04166	0.2353E 02	0.2353E 02
315	0.99970	0.4424E 03	0.2384E 02	0.04269	0.2384E 02	0.2384E 02
316	0.99969	0.4823E 03	0.2353E 02	0.04080	0.2353E 02	0.2353E 02
317	0.99968	0.5117E 03	0.2316E 02	0.03934	0.2316E 02	0.2315E 02
318	0.99967	0.4995E 03	0.2144E 02	0.03833	0.2144E 02	0.2144E 02
319	0.99967	0.5743E 03	0.2285E 02	0.03686	0.2285E 02	0.2285E 02
320	0.99965	0.6011E 03	0.2258E 02	0.03573	0.2258E 02	0.2258E 02
321	0.99964	0.6394E 03	0.2221E 02	0.03419	0.2221E 02	0.2221E 02
322	0.99962	0.6804E 03	0.2177E 02	0.03256	0.2177E 02	0.2176E 02
323	0.99960	0.7160E 03	0.2141E 02	0.03119	0.2141E 02	0.2141E 02
324	0.99959	0.7556E 03	0.2108E 02	0.02989	0.2108E 02	0.2108E 02
325	0.99957	0.7845E 03	0.2076E 02	0.02887	0.2076E 02	0.2076E 02
326	0.99956	0.8143E 03	0.2053E 02	0.02793	0.2053E 02	0.2053E 02
327	0.99955	0.8386E 03	0.2030E 02	0.02716	0.2030E 02	0.2030E 02
328	0.99952	0.8962E 03	0.1986E 02	0.02546	0.1986E 02	0.1986E 02
329	0.99952	0.9206E 03	0.2018E 02	0.02560	0.2018E 02	0.2018E 02
330	0.99954	0.8214E 03	0.2071E 02	0.02888	0.2071E 02	0.2071E 02
331	0.99946	0.1001E 04	0.1975E 02	0.02433	0.1975E 02	0.1975E 02
332	0.99939	0.1118E 04	0.1854E 02	0.02125	0.1854E 02	0.1855E 02
333	0.99932	0.1223E 04	0.1783E 02	0.01906	0.1783E 02	0.1783E 02
334	0.99925	0.1315E 04	0.1706E 02	0.01715	0.1706E 02	0.1706E 02
335	0.99915	0.1428E 04	0.1613E 02	0.01500	0.1613E 02	0.1613E 02
336	0.99912	0.1470E 04	0.1585E 02	0.01440	0.1585E 02	0.1585E 02
337	0.99906	0.1525E 04	0.1535E 02	0.01341	0.1535E 02	0.1536E 02
338	0.99900	0.1581E 04	0.1498E 02	0.01256	0.1498E 02	0.1499E 02
339	0.99893	0.1636E 04	0.1457E 02	0.01174	0.1457E 02	0.1458E 02
340	0.99888	0.1695E 04	0.1417E 02	0.01109	0.1417E 02	0.1418E 02
341	0.99883	0.1729E 04	0.1394E 02	0.01066	0.1393E 02	0.1395E 02
342	0.99878	0.1765E 04	0.1363E 02	0.01014	0.1363E 02	0.1364E 02
343	0.99874	0.1792E 04	0.1344E 02	0.00981	0.1344E 02	0.1345E 02
344	0.99866	0.1789E 04	0.1310E 02	0.00918	0.1310E 02	0.1311E 02
345	0.99862	0.1806E 04	0.1285E 02	0.00886	0.1285E 02	0.1286E 02
346	0.99856	0.1833E 04	0.1259E 02	0.00846	0.1259E 02	0.1260E 02
347	0.99851	0.1856E 04	0.1237E 02	0.00815	0.1237E 02	0.1238E 02

TABLE 12 APPARENT GAS PERMEABILITY RESULTS FOR CORE 3 (CONTINUED)

RUN	ZX	FCK (MD PSIA)	PERM (MD)	KPAV (1/PSIA)	PERMZ (MD)	PERM1 (MD)
348	0.99846	0.1885E 04	0.1221E 02	0.00784	0.1221E 02	0.1222E 02
349	0.99845	0.1764E 04	0.1130E 02	0.00775	0.1130E 02	0.1131E 02
351	0.99941	0.1059E 04	0.1939E 02	0.02313	0.1939E 02	0.1939E 02
352	0.99937	0.1114E 04	0.1886E 02	0.02178	0.1886E 02	0.1886E 02
353	0.99929	0.1229E 04	0.1781E 02	0.01913	0.1781E 02	0.1781E 02
354	0.99922	0.1326E 04	0.1718E 02	0.01731	0.1718E 02	0.1719E 02
355	0.99914	0.1417E 04	0.1644E 02	0.01558	0.1644E 02	0.1645E 02
356	0.99907	0.1490E 04	0.1588E 02	0.01432	0.1588E 02	0.1589E 02
357	0.99899	0.1568E 04	0.1535E 02	0.01312	0.1535E 02	0.1536E 02
358	0.99894	0.1612E 04	0.1499E 02	0.01242	0.1499E 02	0.1500E 02
359	0.99888	0.1660E 04	0.1468E 02	0.01175	0.1467E 02	0.1469E 02
360	0.99886	0.1684E 04	0.1457E 02	0.01152	0.1457E 02	0.1458E 02
361	0.99881	0.1724E 04	0.1425E 02	0.01095	0.1425E 02	0.1426E 02
362	0.99875	0.1759E 04	0.1396E 02	0.01046	0.1396E 02	0.1398E 02
363	0.99867	0.1769E 04	0.1362E 02	0.00975	0.1361E 02	0.1363E 02
364	0.99862	0.1777E 04	0.1319E 02	0.00937	0.1319E 02	0.1320E 02
365	0.99856	0.1816E 04	0.1298E 02	0.00891	0.1298E 02	0.1299E 02
366	0.99849	0.1853E 04	0.1272E 02	0.00845	0.1272E 02	0.1273E 02
367	0.99842	0.1895E 04	0.1250E 02	0.00801	0.1250E 02	0.1252E 02
368	0.99841	0.1895E 04	0.1248E 02	0.00801	0.1248E 02	0.1250E 02

TABLE 13 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 3

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
1	0.35046E 13	0.15328E 00	0.35046E 13	0.35129E 13	0.15364E 00
2	0.35580E 13	0.42575E 00	0.35579E 13	0.35690E 13	0.42708E 00
3	0.35618E 13	0.42629E 00	0.35618E 13	0.35729E 13	0.42762E 00
6	0.35619E 13	0.76337E 00	0.35619E 13	0.35667E 13	0.76441E 00
7	0.35524E 13	0.76190E 00	0.35524E 13	0.35557E 13	0.76260E 00
8	0.35988E 13	0.95432E 00	0.35988E 13	0.36065E 13	0.95638E 00
9	0.35812E 13	0.95732E 00	0.35812E 13	0.35877E 13	0.95905E 00
10	0.35711E 13	0.95861E 00	0.35710E 13	0.35737E 13	0.95933E 00
11	0.35723E 13	0.11367E 01	0.35723E 13	0.35746E 13	0.11374E 01
12	0.35658E 13	0.11364E 01	0.35658E 13	0.35691E 13	0.11375E 01
13	0.36055E 13	0.13756E 01	0.36055E 13	0.36092E 13	0.13770E 01
14	0.35886E 13	0.13799E 01	0.35886E 13	0.35932E 13	0.13816E 01
15	0.35998E 13	0.15957E 01	0.35998E 13	0.36054E 13	0.15982E 01
16	0.35913E 13	0.15976E 01	0.35913E 13	0.35969E 13	0.16003E 01
17	0.36112E 13	0.17722E 01	0.36112E 13	0.36135E 13	0.17733E 01
18	0.35959E 13	0.17769E 01	0.35959E 13	0.35989E 13	0.17784E 01
19	0.31430E 13	0.23231E 01	0.31430E 13	0.31447E 13	0.23244E 01
20	0.31504E 13	0.29838E 01	0.31504E 13	0.31535E 13	0.29868E 01
21	0.33226E 13	0.39733E 01	0.33226E 13	0.33244E 13	0.39755E 01
22	0.33269E 13	0.52898E 01	0.33269E 13	0.33277E 13	0.52912E 01
23	0.34762E 13	0.70083E 01	0.34762E 13	0.34774E 13	0.70107E 01
24	0.35828E 13	0.81503E 01	0.35828E 13	0.35839E 13	0.81527E 01
25	0.35720E 13	0.96956E 01	0.35720E 13	0.35731E 13	0.96987E 01
26	0.35987E 13	0.10994E 02	0.35987E 13	0.35998E 13	0.10997E 02
27	0.36686E 13	0.12207E 02	0.36686E 13	0.36695E 13	0.12209E 02
28	0.37304E 13	0.15426E 02	0.37305E 13	0.37310E 13	0.15428E 02
29	0.38090E 13	0.18624E 02	0.38090E 13	0.38093E 13	0.18625E 02
30	0.38505E 13	0.22117E 02	0.38505E 13	0.38506E 13	0.22117E 02
31	0.39241E 13	0.25342E 02	0.39241E 13	0.39243E 13	0.25343E 02
32	0.40036E 13	0.28851E 02	0.40037E 13	0.40040E 13	0.28852E 02
33	0.40663E 13	0.32730E 02	0.40664E 13	0.40666E 13	0.32731E 02
34	0.41097E 13	0.36653E 02	0.41098E 13	0.41100E 13	0.36654E 02
35	0.41715E 13	0.40986E 02	0.41716E 13	0.41715E 13	0.40986E 02
36	0.36747E 13	0.14278E 02	0.36747E 13	0.36758E 13	0.14282E 02
37	0.37621E 13	0.17252E 02	0.37622E 13	0.37631E 13	0.17257E 02
38	0.38060E 13	0.20599E 02	0.38060E 13	0.38069E 13	0.20604E 02
39	0.39060E 13	0.23679E 02	0.39061E 13	0.39069E 13	0.23684E 02
40	0.39506E 13	0.27522E 02	0.39506E 13	0.39513E 13	0.27527E 02
41	0.40129E 13	0.31559E 02	0.40130E 13	0.40136E 13	0.31564E 02
42	0.40662E 13	0.35016E 02	0.40663E 13	0.40669E 13	0.35021E 02

TABLE 13 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 3 (CONTINUED)

RUN	FPS (1/SQ FT)	FW (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
43	0.41519E 13	0.39055E 02	0.41520E 13	0.41525E 13	0.39059E 02
44	0.41896E 13	0.45031E 02	0.41898E 13	0.41898E 13	0.45031E 02
45	0.42883E 13	0.47781E 02	0.42884E 13	0.42883E 13	0.47779E 02
46	0.43794E 13	0.55604E 02	0.43796E 13	0.43791E 13	0.55598E 02
47	0.44081E 13	0.62120E 02	0.44082E 13	0.44079E 13	0.62115E 02
48	0.45105E 13	0.68769E 02	0.45107E 13	0.45101E 13	0.68760E 02
49	0.45935E 13	0.76608E 02	0.45937E 13	0.45932E 13	0.76598E 02
50	0.45215E 13	0.78021E 02	0.45217E 13	0.45207E 13	0.78004E 02
51	0.47717E 13	0.10418E 03	0.47720E 13	0.47708E 13	0.10415E 03
52	0.50412E 13	0.13484E 03	0.50416E 13	0.50397E 13	0.13479E 03
53	0.51666E 13	0.15321E 03	0.51670E 13	0.51646E 13	0.15314E 03
54	0.55172E 13	0.19577E 03	0.55177E 13	0.55144E 13	0.19566E 03
55	0.59594E 13	0.26784E 03	0.59600E 13	0.59547E 13	0.26760E 03
56	0.62157E 13	0.31040E 03	0.62164E 13	0.62100E 13	0.31008E 03
57	0.65595E 13	0.37250E 03	0.65603E 13	0.65517E 13	0.37202E 03
58	0.67256E 13	0.41138E 03	0.67264E 13	0.67152E 13	0.41076E 03
59	0.69903E 13	0.46989E 03	0.69911E 13	0.69796E 13	0.46912E 03
60	0.71405E 13	0.49778E 03	0.71413E 13	0.71271E 13	0.49680E 03
61	0.73087E 13	0.48650E 03	0.73094E 13	0.72941E 13	0.48548E 03
62	0.67688E 13	0.40216E 03	0.67696E 13	0.67510E 13	0.40165E 03
63	0.86023E 13	0.84035E 03	0.86030E 13	0.85857E 13	0.83856E 03
63	0.81777E 13	0.71973E 03	0.81783E 13	0.81640E 13	0.71847E 03
64	0.94502E 13	0.10619E 04	0.94505E 13	0.94227E 13	0.10588E 04
65	0.10271E 14	0.12885E 04	0.10270E 14	0.10233E 14	0.12838E 04
66	0.10883E 14	0.15342E 04	0.10882E 14	0.10835E 14	0.15276E 04
67	0.11449E 14	0.17249E 04	0.11448E 14	0.11390E 14	0.17152E 04
68	0.11211E 14	0.16587E 04	0.11209E 14	0.11150E 14	0.16499E 04
69	0.10420E 14	0.14012E 04	0.10419E 14	0.10364E 14	0.13939E 04
70	0.97897E 13	0.11840E 04	0.97890E 13	0.97404E 13	0.11781E 04
71	0.87658E 13	0.89165E 03	0.87656E 13	0.87251E 13	0.88753E 03
72	0.82313E 13	0.73838E 03	0.82311E 13	0.81973E 13	0.73535E 03
73	0.76667E 13	0.61666E 03	0.76667E 13	0.76369E 13	0.61427E 03
74	0.73294E 13	0.51934E 03	0.73301E 13	0.73252E 13	0.51899E 03
75	0.71410E 13	0.52844E 03	0.71412E 13	0.71178E 13	0.52670E 03
76	0.58658E 13	0.26508E 03	0.58663E 13	0.58581E 13	0.26471E 03
78	0.68429E 13	0.43667E 03	0.68434E 13	0.68331E 13	0.43601E 03
79	0.73257E 13	0.55132E 03	0.73263E 13	0.73135E 13	0.55036E 03
80	0.91727E 13	0.97350E 03	0.91731E 13	0.91502E 13	0.97107E 03
81	0.10479E 14	0.13857E 04	0.10478E 14	0.10442E 14	0.13810E 04
82	0.11862E 14	0.18575E 04	0.11864E 14	0.11852E 14	0.18556E 04

TABLE 13 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 3
(CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
83	0.13097E 14	0.23249E 04	0.13094E 14	0.13022E 14	0.23123E 04
84	0.13575E 14	0.25367E 04	0.13570E 14	0.13484E 14	0.25207E 04
85	0.12508E 14	0.21616E 04	0.12504E 14	0.12423E 14	0.21477E 04
86	0.11207E 14	0.16629E 04	0.11205E 14	0.11139E 14	0.16531E 04
87	0.94701E 13	0.10833E 04	0.94694E 13	0.94202E 13	0.10776E 04
88	0.83438E 13	0.73908E 03	0.83436E 13	0.83066E 13	0.73581E 03
89	0.35210E 13	0.44501E-01	0.35209E 13	0.36308E 13	0.45888E-01
90	0.35761E 13	0.44162E-01	0.35760E 13	0.37133E 13	0.45858E-01
91	0.35688E 13	0.44252E-01	0.35687E 13	0.37057E 13	0.45952E-01
92	0.36061E 13	0.44453E-01	0.36060E 13	0.37160E 13	0.45809E-01
93	0.34659E 13	0.21933E 00	0.34659E 13	0.34935E 13	0.22108E 00
94	0.34922E 13	0.21768E 00	0.34922E 13	0.35201E 13	0.21942E 00
95	0.34922E 13	0.21768E 00	0.34922E 13	0.35201E 13	0.21942E 00
96	0.34836E 13	0.32949E 00	0.34836E 13	0.34985E 13	0.33090E 00
97	0.34909E 13	0.33310E 00	0.34909E 13	0.35057E 13	0.33450E 00
98	0.35122E 13	0.33097E 00	0.35122E 13	0.35270E 13	0.33237E 00
99	0.35365E 13	0.32869E 00	0.35365E 13	0.35514E 13	0.33008E 00
100	0.34758E 13	0.12190E 00	0.34756E 13	0.35562E 13	0.12473E 00
103	0.35309E 13	0.68837E-01	0.35308E 13	0.36182E 13	0.70540E-01
104	0.35099E 13	0.13917E 00	0.35099E 13	0.35699E 13	0.14155E 00
106	0.35741E 13	0.26865E 00	0.35741E 13	0.35965E 13	0.27033E 00
107	0.35603E 13	0.27621E 00	0.35602E 13	0.35989E 13	0.27922E 00
108	0.35622E 13	0.27395E 00	0.35621E 13	0.35884E 13	0.27597E 00
109	0.34029E 13	0.36400E 00	0.34029E 13	0.34098E 13	0.36473E 00
110	0.34908E 13	0.42536E 00	0.34908E 13	0.35104E 13	0.42776E 00
111	0.35238E 13	0.49266E 00	0.35238E 13	0.35360E 13	0.49437E 00
112	0.35069E 13	0.56435E 00	0.35068E 13	0.35175E 13	0.56607E 00
113	0.34897E 13	0.63739E 00	0.34897E 13	0.34991E 13	0.63912E 00
114	0.35009E 13	0.70935E 00	0.35009E 13	0.35127E 13	0.71174E 00
116	0.55984E 13	0.20201E 03	0.55990E 13	0.55976E 13	0.20196E 03
117	0.58825E 13	0.24399E 03	0.58832E 13	0.58805E 13	0.24388E 03
118	0.61570E 13	0.29649E 03	0.61578E 13	0.61539E 13	0.29631E 03
119	0.63028E 13	0.32013E 03	0.63036E 13	0.62992E 13	0.31990E 03
120	0.64639E 13	0.35090E 03	0.64648E 13	0.64598E 13	0.35063E 03
121	0.66735E 13	0.38677E 03	0.66744E 13	0.66681E 13	0.38640E 03
122	0.68272E 13	0.42102E 03	0.68281E 13	0.68210E 13	0.42058E 03
123	0.69656E 13	0.45185E 03	0.69665E 13	0.69577E 13	0.45128E 03
124	0.71374E 13	0.48645E 03	0.71384E 13	0.71291E 13	0.48582E 03
125	0.71775E 13	0.49392E 03	0.71784E 13	0.71681E 13	0.49321E 03
126	0.73066E 13	0.51911E 03	0.73075E 13	0.72961E 13	0.51829E 03

TABLE 13 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 3 (CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
127	0.73939E 13	0.54403E 03	0.73948E 13	0.73824E 13	0.54313E 03
128	0.75402E 13	0.57820E 03	0.75410E 13	0.75274E 13	0.57716E 03
129	0.77517E 13	0.56266E 03	0.77525E 13	0.77385E 13	0.56164E 03
130	0.91478E 13	0.89465E 03	0.91488E 13	0.91268E 13	0.89250E 03
131	0.10558E 14	0.13597E 04	0.10558E 14	0.10523E 14	0.13551E 04
132	0.10924E 14	0.14988E 04	0.10924E 14	0.10881E 14	0.14928E 04
134	0.34130E 13	0.47393E 01	0.34130E 13	0.34108E 13	0.47364E 01
135	0.35188E 13	0.72067E 01	0.35189E 13	0.35170E 13	0.72029E 01
136	0.35965E 13	0.97370E 01	0.35965E 13	0.35955E 13	0.97343E 01
137	0.37177E 13	0.11700E 02	0.37177E 13	0.37162E 13	0.11695E 02
138	0.37206E 13	0.15295E 02	0.37206E 13	0.37195E 13	0.15290E 02
139	0.37888E 13	0.18627E 02	0.37888E 13	0.37879E 13	0.18623E 02
140	0.38573E 13	0.22012E 02	0.38574E 13	0.38562E 13	0.22006E 02
141	0.39185E 13	0.24913E 02	0.39186E 13	0.39178E 13	0.24908E 02
142	0.40027E 13	0.29153E 02	0.40028E 13	0.40018E 13	0.29146E 02
143	0.40638E 13	0.33367E 02	0.40639E 13	0.40628E 13	0.33358E 02
144	0.41017E 13	0.36859E 02	0.41018E 13	0.41006E 13	0.36848E 02
145	0.41490E 13	0.40103E 02	0.41491E 13	0.41477E 13	0.40090E 02
146	0.42652E 13	0.46823E 02	0.42653E 13	0.42640E 13	0.46808E 02
147	0.43669E 13	0.55077E 02	0.43671E 13	0.43658E 13	0.55060E 02
148	0.44484E 13	0.61375E 02	0.44485E 13	0.44467E 13	0.61351E 02
149	0.45327E 13	0.69856E 02	0.45328E 13	0.45309E 13	0.69828E 02
150	0.46342E 13	0.78243E 02	0.46344E 13	0.46325E 13	0.78210E 02
151	0.45969E 13	0.79249E 02	0.45971E 13	0.45951E 13	0.79216E 02
152	0.48455E 13	0.10915E 03	0.48458E 13	0.48434E 13	0.10910E 03
153	0.49994E 13	0.13048E 03	0.49997E 13	0.49972E 13	0.13041E 03
154	0.54304E 13	0.18333E 03	0.54309E 13	0.54274E 13	0.18322E 03
155	0.58812E 13	0.25159E 03	0.58817E 13	0.58771E 13	0.25139E 03
156	0.62324E 13	0.31516E 03	0.62330E 13	0.62271E 13	0.31486E 03
157	0.67910E 13	0.42479E 03	0.67917E 13	0.67839E 13	0.42430E 03
158	0.72222E 13	0.49846E 03	0.72228E 13	0.72128E 13	0.49777E 03
159	0.75163E 13	0.56302E 03	0.75168E 13	0.75054E 13	0.56217E 03
160	0.76194E 13	0.55540E 03	0.76199E 13	0.76084E 13	0.55456E 03
161	0.93034E 13	0.97257E 03	0.93040E 13	0.92841E 13	0.97049E 03
162	0.11103E 14	0.16251E 04	0.11102E 14	0.11058E 14	0.16201E 04
163	0.13032E 14	0.23568E 04	0.13030E 14	0.12979E 14	0.23476E 04
164	0.11998E 14	0.19631E 04	0.11997E 14	0.11949E 14	0.19554E 04
165	0.10669E 14	0.14386E 04	0.10669E 14	0.10530E 14	0.14333E 04
166	0.10054E 14	0.12560E 04	0.10054E 14	0.10019E 14	0.12516E 04
167	0.36567E 13	0.49086E 00	0.36566E 13	0.35521E 13	0.47684E 00

TABLE 13 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 3 (CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
169	0.34622E 13	0.82505E 00	0.34622E 13	0.34544E 13	0.82319E 00
170	0.35000E 13	0.12406E 01	0.35000E 13	0.34936E 13	0.12383E 01
171	0.34686E 13	0.13058E 01	0.34686E 13	0.34622E 13	0.13034E 01
172	0.35702E 13	0.12148E 01	0.35702E 13	0.35623E 13	0.12121E 01
173	0.35370E 13	0.16531E 01	0.35370E 13	0.35311E 13	0.16503E 01
174	0.35650E 13	0.12454E 01	0.35650E 13	0.35676E 13	0.12463E 01
176	0.38537E 13	0.12977E 01	0.38537E 13	0.38461E 13	0.12951E 01
177	0.39380E 13	0.15969E 01	0.39380E 13	0.39308E 13	0.15939E 01
178	0.37855E 13	0.15227E 01	0.37855E 13	0.37798E 13	0.15204E 01
179	0.40405E 13	0.12320E 01	0.40404E 13	0.40370E 13	0.12309E 01
180	0.38829E 13	0.14477E 01	0.38829E 13	0.38840E 13	0.14481E 01
181	0.35439E 13	0.14301E 01	0.35439E 13	0.35117E 13	0.14171E 01
189	0.35507E 13	0.14301E 01	0.35507E 13	0.35186E 13	0.14171E 01
182	0.35436E 13	0.10196E 01	0.35436E 13	0.35045E 13	0.10084E 01
190	0.35664E 13	0.10196E 01	0.35664E 13	0.35273E 13	0.10085E 01
183	0.34349E 13	0.34732E 00	0.34343E 13	0.30976E 13	0.31327E 00
184	0.34136E 13	0.58160E 00	0.34129E 13	0.31234E 13	0.53228E 00
185	0.36165E 13	0.61641E 00	0.36152E 13	0.32356E 13	0.55169E 00
186	0.36419E 13	0.33520E 00	0.36392E 13	0.28776E 13	0.26506E 00
187	0.36287E 13	0.56815E 00	0.36265E 13	0.31106E 13	0.48733E 00
188	0.37052E 13	0.41474E 00	0.37010E 13	0.28381E 13	0.31804E 00
200	0.34010E 13	0.19860E 00	0.34012E 13	0.31735E 13	0.18530E 00
213	0.34175E 13	0.19860E 00	0.34176E 13	0.31899E 13	0.18537E 00
201	0.35650E 13	0.41957E 00	0.35651E 13	0.34632E 13	0.40759E 00
214	0.34538E 13	0.41957E 00	0.34538E 13	0.33519E 13	0.40719E 00
202	0.35045E 13	0.24767E 00	0.35046E 13	0.33240E 13	0.23490E 00
215	0.35528E 13	0.24767E 00	0.35528E 13	0.33723E 13	0.23508E 00
203	0.35036E 13	0.11228E 01	0.35036E 13	0.34633E 13	0.11099E 01
216	0.34998E 13	0.11228E 01	0.34998E 13	0.34595E 13	0.11099E 01
204	0.34244E 13	0.21805E 00	0.34243E 13	0.31960E 13	0.20351E 00
217	0.34382E 13	0.21805E 00	0.34382E 13	0.32099E 13	0.20357E 00
218	0.35357E 13	0.31076E 00	0.35357E 13	0.33759E 13	0.29681E 00
206	0.35479E 13	0.96246E 00	0.35479E 13	0.34947E 13	0.94803E 00
219	0.35390E 13	0.96246E 00	0.35390E 13	0.34858E 13	0.94800E 00
207	0.34250E 13	0.90342E-01	0.34246E 13	0.28079E 13	0.74074E-01
208	0.35413E 13	0.37181E 00	0.35410E 13	0.33648E 13	0.35331E 00
221	0.34153E 13	0.37181E 00	0.34151E 13	0.32388E 13	0.35262E 00
209	0.35279E 13	0.29934E 00	0.35273E 13	0.32376E 13	0.27475E 00
222	0.36010E 13	0.29934E 00	0.36005E 13	0.33108E 13	0.27526E 00
210	0.34965E 13	0.61242E 00	0.34961E 13	0.33254E 13	0.58251E 00

TABLE 13 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 3
(CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	FIQ (1/FT)
223	0.35465E 13	0.43960E 00	0.35456E 13	0.32485E 13	0.40275E 00
212	0.37069E 13	0.67789E 00	0.37061E 13	0.34969E 13	0.63962E 00
224	0.36116E 13	0.67789E 00	0.36108E 13	0.34015E 13	0.63859E 00
225	0.35221E 13	0.17809E 00	0.35222E 13	0.35762E 13	0.18082E 00
241	0.33524E 13	0.17809E 00	0.33524E 13	0.34066E 13	0.18096E 00
226	0.34982E 13	0.37855E 00	0.34982E 13	0.35267E 13	0.38162E 00
227	0.34721E 13	0.58616E 00	0.34721E 13	0.34890E 13	0.58901E 00
243	0.34162E 13	0.58616E 00	0.34162E 13	0.34331E 13	0.58906E 00
228	0.34890E 13	0.78999E 00	0.34890E 13	0.34893E 13	0.79005E 00
244	0.34537E 13	0.78999E 00	0.34537E 13	0.34540E 13	0.79005E 00
229	0.34990E 13	0.10050E 01	0.34990E 13	0.35070E 13	0.10073E 01
245	0.34829E 13	0.10050E 01	0.34829E 13	0.34909E 13	0.10073E 01
230	0.35408E 13	0.12086E 01	0.35408E 13	0.35513E 13	0.12121E 01
246	0.35156E 13	0.12086E 01	0.35156E 13	0.35261E 13	0.12122E 01
247	0.34413E 13	0.24914E 00	0.34413E 13	0.34806E 13	0.25199E 00
232	0.34666E 13	0.52222E 00	0.34666E 13	0.34879E 13	0.52541E 00
248	0.34262E 13	0.17184E 00	0.34262E 13	0.34950E 13	0.17529E 00
234	0.34897E 13	0.36389E 00	0.34898E 13	0.35228E 13	0.36733E 00
249	0.34573E 13	0.36389E 00	0.34573E 13	0.34903E 13	0.36737E 00
235	0.34786E 13	0.57068E 00	0.34786E 13	0.34981E 13	0.57387E 00
250	0.34652E 13	0.57068E 00	0.34652E 13	0.34847E 13	0.57389E 00
236	0.35151E 13	0.77093E 00	0.35152E 13	0.35313E 13	0.77445E 00
251	0.35053E 13	0.77093E 00	0.35053E 13	0.35214E 13	0.77447E 00
252	0.34673E 13	0.15435E 00	0.34674E 13	0.35366E 13	0.15743E 00
238	0.35238E 13	0.16298E 00	0.35238E 13	0.36133E 13	0.16711E 00
253	0.33457E 13	0.16298E 00	0.33458E 13	0.34353E 13	0.16734E 00
239	0.35202E 13	0.22369E 00	0.35203E 13	0.35652E 13	0.22654E 00
254	0.34896E 13	0.22369E 00	0.34896E 13	0.35346E 13	0.22657E 00
240	0.34817E 13	0.12814E 00	0.34818E 13	0.36028E 13	0.13259E 00
255	0.34340E 13	0.12814E 00	0.34341E 13	0.35551E 13	0.13266E 00
256	0.32955E 13	0.11901E 00	0.32956E 13	0.34030E 13	0.12288E 00
257	0.36228E 13	0.92916E 01	0.36228E 13	0.36252E 13	0.92977E 01
258	0.37151E 13	0.13420E 02	0.37151E 13	0.37162E 13	0.13424E 02
259	0.37883E 13	0.16421E 02	0.37883E 13	0.37898E 13	0.16428E 02
260	0.38637E 13	0.19617E 02	0.38638E 13	0.38646E 13	0.19622E 02
261	0.39708E 13	0.25385E 02	0.39709E 13	0.39722E 13	0.25393E 02
262	0.37100E 13	0.12612E 02	0.37100E 13	0.37110E 13	0.12615E 02
263	0.37500E 13	0.14869E 02	0.37501E 13	0.37518E 13	0.14876E 02
264	0.38076E 13	0.17886E 02	0.38076E 13	0.38092E 13	0.17893E 02
265	0.38854E 13	0.21891E 02	0.38854E 13	0.38877E 13	0.21904E 02

TABLE 13 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 3 (CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	F9Q (1/FT)
266	0.39430E 13	0.22893E 02	0.39431E 13	0.39446E 13	0.22902E 02
267	0.40496E 13	0.26716E 02	0.40497E 13	0.40514E 13	0.26728E 02
268	0.40280E 13	0.26878E 02	0.40281E 13	0.40294E 13	0.26887E 02
269	0.40480E 13	0.28740E 02	0.40481E 13	0.40503E 13	0.28755E 02
270	0.41014E 13	0.32639E 02	0.41015E 13	0.41032E 13	0.32653E 02
271	0.41621E 13	0.37003E 02	0.41622E 13	0.41637E 13	0.37016E 02
272	0.41888E 13	0.40989E 02	0.41890E 13	0.41905E 13	0.41004E 02
273	0.42490E 13	0.44631E 02	0.42491E 13	0.42507E 13	0.44648E 02
274	0.42999E 13	0.48547E 02	0.43000E 13	0.43011E 13	0.48560E 02
275	0.43562E 13	0.53050E 02	0.43563E 13	0.43574E 13	0.53063E 02
276	0.43993E 13	0.57531E 02	0.43994E 13	0.44004E 13	0.57544E 02
277	0.44651E 13	0.60175E 02	0.44652E 13	0.44666E 13	0.60194E 02
278	0.45035E 13	0.64552E 02	0.45037E 13	0.45038E 13	0.64553E 02
279	0.45397E 13	0.67774E 02	0.45399E 13	0.45407E 13	0.67787E 02
280	0.45903E 13	0.71909E 02	0.45905E 13	0.45911E 13	0.71920E 02
281	0.46435E 13	0.76100E 02	0.46438E 13	0.46452E 13	0.76123E 02
282	0.46834E 13	0.79850E 02	0.46836E 13	0.46845E 13	0.79864E 02
283	0.47742E 13	0.87501E 02	0.47744E 13	0.47749E 13	0.87510E 02
284	0.47953E 13	0.91735E 02	0.47955E 13	0.47966E 13	0.91756E 02
285	0.47581E 13	0.93823E 02	0.47583E 13	0.47588E 13	0.93833E 02
286	0.47218E 13	0.90757E 02	0.47221E 13	0.47222E 13	0.90759E 02
287	0.48470E 13	0.11310E 03	0.48474E 13	0.48478E 13	0.11311E 03
288	0.50987E 13	0.13754E 03	0.50992E 13	0.50987E 13	0.13753E 03
289	0.53571E 13	0.16888E 03	0.53576E 13	0.53570E 13	0.16886E 03
290	0.55396E 13	0.18995E 03	0.55402E 13	0.55392E 13	0.18991E 03
291	0.45288E 13	0.76884E 02	0.45290E 13	0.45290E 13	0.76883E 02
292	0.51099E 13	0.12893E 03	0.51102E 13	0.51082E 13	0.12888E 03
293	0.56080E 13	0.20304E 03	0.56086E 13	0.56063E 13	0.20296E 03
294	0.57518E 13	0.22707E 03	0.57524E 13	0.57494E 13	0.22695E 03
295	0.58308E 13	0.24036E 03	0.58315E 13	0.58279E 13	0.24021E 03
296	0.59775E 13	0.26677E 03	0.59782E 13	0.59740E 13	0.26659E 03
298	0.62189E 13	0.30743E 03	0.62196E 13	0.62139E 13	0.30715E 03
299	0.63212E 13	0.32633E 03	0.63219E 13	0.63157E 13	0.32600E 03
300	0.63952E 13	0.34714E 03	0.63960E 13	0.63885E 13	0.34673E 03
301	0.65274E 13	0.36830E 03	0.65282E 13	0.65221E 13	0.36795E 03
302	0.66137E 13	0.38599E 03	0.66145E 13	0.66069E 13	0.38555E 03
303	0.67744E 13	0.41930E 03	0.67753E 13	0.67677E 13	0.41883E 03
304	0.68665E 13	0.43877E 03	0.68674E 13	0.68591E 13	0.43824E 03
305	0.70071E 13	0.46585E 03	0.70079E 13	0.69991E 13	0.46526E 03
306	0.72742E 13	0.49835E 03	0.72751E 13	0.72650E 13	0.49766E 03

TABLE 13 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 3 (CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	F9Q (1/FT)
307	0.74171E 13	0.52683E 03	0.74180E 13	0.74075E 13	0.52608E 03
308	0.74982E 13	0.55502E 03	0.74990E 13	0.74878E 13	0.55419E 03
309	0.75843E 13	0.57499E 03	0.75851E 13	0.75739E 13	0.57413E 03
310	0.76967E 13	0.59853E 03	0.76976E 13	0.76862E 13	0.59765E 03
311	0.77796E 13	0.62098E 03	0.77805E 13	0.77684E 13	0.62002E 03
313	0.39398E 13	0.25016E 02	0.39399E 13	0.39406E 13	0.25021E 02
314	0.40005E 13	0.28805E 02	0.40006E 13	0.40014E 13	0.28810E 02
315	0.39480E 13	0.26411E 02	0.39481E 13	0.39488E 13	0.26416E 02
316	0.40004E 13	0.30103E 02	0.40005E 13	0.40013E 13	0.30109E 02
317	0.40653E 13	0.33086E 02	0.40653E 13	0.40659E 13	0.33091E 02
318	0.43906E 13	0.33123E 02	0.43907E 13	0.43914E 13	0.33129E 02
319	0.41191E 13	0.39267E 02	0.41192E 13	0.41197E 13	0.39272E 02
320	0.41684E 13	0.42678E 02	0.41685E 13	0.41692E 13	0.42685E 02
321	0.42381E 13	0.47407E 02	0.42382E 13	0.42387E 13	0.47413E 02
322	0.43248E 13	0.52942E 02	0.43249E 13	0.43252E 13	0.52945E 02
323	0.43973E 13	0.58324E 02	0.43975E 13	0.43977E 13	0.58327E 02
324	0.44663E 13	0.64015E 02	0.44665E 13	0.44664E 13	0.64013E 02
325	0.45348E 13	0.68791E 02	0.45349E 13	0.45349E 13	0.68790E 02
326	0.45852E 13	0.73797E 02	0.45853E 13	0.45854E 13	0.73797E 02
327	0.46374E 13	0.78180E 02	0.46376E 13	0.46376E 13	0.78179E 02
328	0.47387E 13	0.89100E 02	0.47390E 13	0.47388E 13	0.89096E 02
329	0.46656E 13	0.91047E 02	0.46659E 13	0.46655E 13	0.91043E 02
330	0.45446E 13	0.73003E 02	0.45448E 13	0.45449E 13	0.73004E 02
331	0.47669E 13	0.10550E 03	0.47672E 13	0.47666E 13	0.10549E 03
332	0.50761E 13	0.13470E 03	0.50764E 13	0.50756E 13	0.13458E 03
333	0.52803E 13	0.16387E 03	0.52807E 13	0.52791E 13	0.16382E 03
334	0.55182E 13	0.19600E 03	0.55188E 13	0.55172E 13	0.19595E 03
335	0.58370E 13	0.24289E 03	0.58377E 13	0.58349E 13	0.24277E 03
336	0.59383E 13	0.26015E 03	0.59390E 13	0.59361E 13	0.26002E 03
337	0.61330E 13	0.28977E 03	0.61337E 13	0.61298E 13	0.28959E 03
338	0.62840E 13	0.32060E 03	0.62848E 13	0.62812E 13	0.32042E 03
339	0.64598E 13	0.35466E 03	0.64606E 13	0.64556E 13	0.35439E 03
340	0.66409E 13	0.38868E 03	0.66418E 13	0.66367E 13	0.38838E 03
341	0.67549E 13	0.41253E 03	0.67558E 13	0.67495E 13	0.41214E 03
342	0.69063E 13	0.44254E 03	0.69073E 13	0.69012E 13	0.44215E 03
343	0.70055E 13	0.46409E 03	0.70065E 13	0.69997E 13	0.46364E 03
344	0.71855E 13	0.49480E 03	0.71865E 13	0.71800E 13	0.49436E 03
345	0.73243E 13	0.51706E 03	0.73252E 13	0.73175E 13	0.51652E 03
346	0.74766E 13	0.54914E 03	0.74776E 13	0.74695E 13	0.54855E 03
347	0.76084E 13	0.57694E 03	0.76094E 13	0.76008E 13	0.57628E 03

TABLE 13 VISCO-INERTIAL FLOW CHARACTERISTICS OF CORE 3
(CONTINUED)

RUN	FPS (1/SQ FT)	FQ (1/FT)	FZPS (1/SQ FT)	FIPS (1/SQ FT)	F9Q (1/FT)
348	0.77113E 13	0.60867E 03	0.77123E 13	0.77034E 13	0.60796E 03
349	0.83309E 13	0.57617E 03	0.83320E 13	0.83222E 13	0.57550E 03
351	0.48547E 13	0.11834E 03	0.48551E 13	0.48542E 13	0.11831E 03
352	0.49919E 13	0.13204E 03	0.49923E 13	0.49909E 13	0.13200E 03
353	0.52863E 13	0.16574E 03	0.52868E 13	0.52852E 13	0.16568E 03
354	0.54783E 13	0.19738E 03	0.54789E 13	0.54761E 13	0.19728E 03
355	0.57261E 13	0.23424E 03	0.57267E 13	0.57237E 13	0.23412E 03
356	0.59264E 13	0.26780E 03	0.59271E 13	0.59228E 13	0.26760E 03
357	0.61311E 13	0.30727E 03	0.61319E 13	0.61272E 13	0.30703E 03
358	0.62793E 13	0.33346E 03	0.62801E 13	0.62750E 13	0.33318E 03
359	0.64141E 13	0.36273E 03	0.64149E 13	0.64093E 13	0.36241E 03
360	0.64620E 13	0.37522E 03	0.64629E 13	0.64573E 13	0.37459E 03
361	0.66051E 13	0.40384E 03	0.66060E 13	0.65994E 13	0.40344E 03
362	0.67413E 13	0.43128E 03	0.67423E 13	0.67345E 13	0.43078E 03
363	0.69139E 13	0.46509E 03	0.69149E 13	0.69074E 13	0.46459E 03
364	0.71363E 13	0.48606E 03	0.71373E 13	0.71291E 13	0.48551E 03
365	0.72511E 13	0.52133E 03	0.72521E 13	0.72443E 13	0.52077E 03
366	0.74017E 13	0.56052E 03	0.74027E 13	0.73940E 13	0.55986E 03
367	0.75279E 13	0.60406E 03	0.75289E 13	0.75195E 13	0.60330E 03
368	0.75412E 13	0.60449E 03	0.75422E 13	0.75321E 13	0.60358E 03

A P P E N D I X   II

THE COMPUTER PROGRAM

Nomenclature of the Computer Input

NCARDS	is the number of data cards to be processed.
NPUN of 0	is the cue for no punch-card output.
NPUN of 7	is the cue for punch-card output.
NPRN of 0	is the cue for no line-printer output.
NPRN of 6	is the cue for line-printer output.
NCORE	is the core identification number.
CLENG (in)	is the length of the core.
CAREA (sq in)	is the cross-sectional area of the core.
CATCM (cm Hg)	is the zero correction for the barometer index.
CPC3 (psig)	is the temperature correction for the zero of 0 to 250 psig Heise gauge.
CPC2 (psig)	is the temperature correction for the zero of 0 to 1500 psig Heise gauge.
NPMBP of 1	is the integer index denoting no back-pressure on the Vol-O-Flo meter.
NPMBP of 2	is the integer index denoting back-pressure on the Vol-O-Flo meter.
P4X06 P4X16	are the constant and the first-degree coefficient, respectively, of the mercury manometer calibration polynomial for the differential pressure transducer.
P5X07 P5X17	are the constant and the first-degree coefficient, respectively, of the water manometer calibration polynomial for the differential pressure transducer.
T1C1 T1C2	are the constant and the first-degree coefficient, respectively, of the potential conversion polynomial for the calibrated upstream thermocouple.

T2C1 T2C2	are the constant and the first-degree coefficient, respectively, of the potential conversion polynomial for the calibrated downstream thermocouple.
NRUN	is the experimental data run identification.
ATCM (cm Hg)	is the barometric pressure reading.
TR (F)	is the room temperature.
VUS (mv)	is the upstream thermocouple potential.
VDS (mv)	is the downstream thermocouple potential.
VM (mv)	is the Vol-O-Flow meter thermocouple potential.
VM (F)	for NQ $\leqslant$ 3 is the Vol-O-Flo meter-run temperature.
VM (F)	for NQ $\geqslant$ 4 is the gas burette temperature.
NP1	is the mnemonic label of the upstream pressure measuring device, described in Table 1.
P1	is the upstream flowing gas pressure, in the units of the corresponding pressure measuring device.
NP2	is the mnemonic label of the downstream pressure measuring device, described in Table 1.
P2	is the downstream flowing gas pressure, in the units of the corresponding pressure measuring device.
NQ	is the mnemonic label of the flow-rate measuring device, described in Table 1.
HVOL(in water)	for NQ$\leqslant$3 is the differential oil manostat reading for the Vol-O-Flo meter.
HVOL (cc)	for NQ$\geqslant$4 is the volume displaced in the gas burette.

PVOL(in water)	for NQ$\leqslant$3 is the back-pressure on the Vol-O-Flo meter.
PVOL (sec)	for NQ$\geqslant$4 is the displacement time in the gas burette.

Nomenclature of the Computer Output

PC1 (psia)	is the upstream flowing gas pressure.
PC2 (psia)	is the downstream flowing gas pressure.
PAV (psia)	is the mean flowing gas pressure.
DIFP (psia)	is the pressure drop across the core.
PBP (psia)	is the back-pressure on the core.
DIFPS (psia^2)	is the pressure-squared gradient across the core.
QSC (scfh)	is the volumetric flow rate at standard conditions of 14.65 psia and 60 F.
RTR (1)	is the reduced upstream temperature.
RTR (2)	is the reduced downstream temperature.
RPR (2)	is the reduced upstream pressure.
RPR (2)	is the reduced downstream pressure.
XKI (1) XKI (2)	are the integrals defined by Equation (45), for the upstream and the downstream reduced pressure conditions.
XZI (1) XZI (2)	are the integrals defined by Equation (44), for the upstream and the downstream reduced pressure conditions.
ZX	is the compressibility factor at $\bar{p}$, $\bar{T}$.
ZIAV	is an integrated-average compressibility factor.

VX($cp \times 10^{-4}$)	is the viscosity of nitrogen at $\bar{p}$, $\bar{T}$.
VIAV($cp \times 10^{-4}$)	is an integrated-average viscosity defined by Equation (36).
PERM (md)	is the apparent gas permeability in Equation (27).
RPAV ($psia^{-1}$)	is the reciprocal mean pressure.
FPS (ft^{-2})	is the group of variables in Equation (32).
FQ (ft^{-1})	is the group of variables in Equation (32).
PERMZ (md)	is the apparent gas permeability in Equation (28).
RTZP ($psia^{-1}$)	is a modified reciprocal mean pressure.
FQK (md psia)	is a grouping proposed as a viscous flow criterion.
FZPS (ft^{-2})	is the group of variables in Equation (33).
PERMI (md)	is the apparent gas permeability in Equation (30).
FIPS (ft^{-2})	is the group of variables in Equation (34).
FIQ (ft^{-1})	is the group of variables in Equation (35).
FPSQ2 (ft^{-1})	is equal to the ratio FPS/FQ, and is used to calculate the friction factor.
RFQ (ft)	is equal to the ratio 1/FQ.
NSRT1 of 1	is an index used to sort punch-card output.
NSRT2 of 2	is an index used to sort punch-card output.
NSRT3 of 3	is an index used to sort punch-card output.
MMP of ($cp \times 10^{-4}$)	is the units of viscosity in Tables 6, 9, and 12.

<u>The Source List of the Computer Program</u>

The source list of the Fortran IV program used to process the experimental data is given in the following pages.

FORTRAN SOURCE LIST

SOURCE STATEMENT

```
C       MAIN COMPUTER PROGRAM
 IBFTC RAM       DECK
        COMMON RTR(2),RPR(2),XKI(2),XZI(2),P,T,ZX,VX,NQ,HVOL,PVOL,
       1ATPSI,VM,TR,TAV,QSC,NPMBP
  119   FORMAT(9X,4F7.4,4E15.8,2F8.5,2F7.2)
  118   FORMAT(1X,I4, 2X,6HPERMZ=,E13.6, 2X,5HRTZP=,F8.5, 7X,
       15HFZPS=,E13.6,4X,4HRFQ=,E13.6)
  117   FORMAT(1X,I4, 2X,6HPERMI=,E13.6, 2X,5H FQK=,E13.6, 2X,
       5HFIPS=,E13.6,2X,4HFIQ=,E13.6,2X,6HFPSQ2=,E13.6)
  116   FORMAT(1X,I4, 2X,6H PERM=,E13.6, 2X,5HRPAV=,F8.5, 7X,
       15H FPS=,E13.6,2X,4H FQ=,E13.6)
  112   FORMAT(I2,13X,I4,1X,5E12.5)
  113   FORMAT(1HJ,5HNRUN=,I4)
  111   FORMAT(I2,11X,I4,F9.5,2E11.4,F9.5,2E11.4)
  110   FORMAT(I2,9X,I4,1X,2F8.2,2F7.2,2E10.4,2F7.2)
  109   FORMAT(10X,4E15.8)
  108   FORMAT(1HL,6E15.8)
  107   FORMAT(1HK,8E15.8)
  105   FORMAT(1H ,I4,5F10.3,48X,F12.2,F10.4)
  104   FORMAT(1H ,2I4)
  103   FORMAT(1H ,I4,F6.2,F5.1,3F8.3,I2,F8.2,I2,F8.3,I2,2F8.2,
       14X,3F7.2)
  102   FORMAT(I4,F6.2,F5.1,3F6.3,I2,F8.2,I2,F8.2,I2,2F6.2)
  101   FORMAT(1HL,6HNCORE=,I3,5X,6HCLENG=,F7.4,5X,6HCAREA=,F7.4,
       15X,6HCATCM=,F5.2,5X,5HCPC3=,F5.2,5X,5HCPC2=,F5.2,
       25X,7HNCARDS=,I4)
  100   FORMAT(1X,I4,2F8.4,3F6.2,I3)
   99   FORMAT(I5)
        NSRT1=1
        NSRT2=2
        NSRT3=3
        CFIRT=.43820678E+05
        CFILT=.94134427E+14
    8   READ(5,99) NCARDS
        IF(NCARDS.EQ.0) STOP
        READ(5,104) NPUN,NPRN
        READ(5,100) NCORE,CLENG,CAREA,CATCM,CPC3,CPC2,NPMBP
        WRITE(6,101) NCORE,CLENG,CAREA,CATCM,CPC3,CPC2,NCARDS
        READ(5,109) P4X06,P4X16,P5X07,P5X17
        READ(5,109) T1C1,T1C2,T2C1,T2C2
        WRITE(6,107) T1C1,T1C2,T2C1,T2C2,P4X06,P4X16,P5X07,P5X17
        DO 31 IC=1,NCARDS
    9   READ(5,102) NRUN,ATCM,TR,VUS,VDS,VM,NP1,P1,NP2,P2,NQ,HVOL,
       1PVOL
        TCT1=1./(1.+1.011111E-04*(TR-32.))
        TCT2=1./(1.+1.022222E-05*(TR-32.))
        ATCM=ATCM+CATCM
        ATPSI=ATCM*.193367*(1.+TCT1-TCT2)
```

FORTRAN SOURCE LIST
(CONTINUED)

```
      SOURCE STATEMENT

      T1=T1C1+T1C2     *(.32044150E+02+.35902292E+02*VUS
     1-.59348321E+00*VUS**2+.68024521E-01*VUS**3)
      RT1=T1+459.7
      T2=T2C1+T2C2     *(.32044150E+02+.35902292E+02*VDS
     1-.59348321E+00*VDS**2+.68024521E-01*VDS**3)
      RT2=T2+459.7
      RTAV=.5*(RT1+RT2)
      TAV=RTAV-459.7
      WRITE(6,113) NRUN
      NP=NP1
      P=P1
      GO TO (18,17,16,15,14),NP
   14 PC=P*(.36013032E-01+.65010191E-05*TR-.97066295E-07*TR**2
     1+.18575971E-09*TR**3)
      GO TO 19
   15 PC=P*(.49272139E+00-.49170519E-04*TR)
      GO TO 19
   16 PC=P+0.1+CPC3
      GO TO 19
   17 PC=.99009901*P+CPC2
      GO TO 19
   18 PC=P-13.0
   19 CONTINUE
      IF(P.EQ.P2) GO TO 20
      PC1=PC+ATPSI
      NP=NP2
      P=P2
      GO TO (18,17,16,15,14,26,27),NP
   26 PC=PC-(P4X06+P4X16*P)
      GO TO 20
   27 PC=PC-(P5X07+P5X17*P)
   20 PC2=PC+ATPSI
      PBP=PC
      DIFP=PC1-PC2
      CALL QSUBR
   25 WRITE(6,103) NRUN,ATCM,TR,VUS,VDS,VM,NP1,P1,NP2,P2,NQ,
     1HVOL,PVOL,T1,T2,TAV
      PAV=.5*(PC1+PC2)
      RPAV=1./PAV
      DIFPS=PC1**2-PC2**2
      P=PAV
      T=RTAV-459.7
      CALL ZINTPL
      CONTINUE
      CALL VINTPL
      RTZP=ZX*RPAV*RTAV/226.9
      PERM=.25665787*CLENG/CAREA*QSC*ZX*VX*RTAV/DIFPS
      FQK=PERM*DIFPS/PAV/2.
```

FORTRAN SOURCE LIST
(CONTINUED)

```
      SOURCE STATEMENT

      FQ=CFIRT*QSC/CAREA/VX
      FPS=.16071946E+20*DIFPS/(ZX*RTAV*VX**2*CLENG*FQ)
      RFQ=1./FQ
      FPSQ2=FPS/FQ
      RTR(1)=RT1/226.9
      RTR(2)=RT2/226.9
      RPR(1)=PC1/492.3
      RPR(2)=PC2/492.3
      TRAV=.5*(RT1+RT2)/226.9
      CFP=CLENG/CAREA*TRAV*QSC
      CALL ZKINT
      CONTINUE
      DENKI=XKI(1)-XKI(2)
      ZNUM=XZI(1)-XZI(2)
      VIAV=182.5*ZNUM/DENKI
      ZIAV=DIFPS/ZNUM/.48471858E+06
      PERMI=.21926373E-01*CFP/DENKI
      FIPS=CFILT/PERMI
      FIQ=CFIRT*QSC/CAREA/VIAV
      PERMZ=.21926373E-01*CFP*VX/182.5/ZNUM
      FZPS=CFILT/PERMZ
      IF(NPRN.EQ.0) GO TO 30
      WRITE(6,105) NRUN,PC1,PC2,PAV,DIFP,PBP,DIFPS,QSC
      WRITE(6,119) RTR(1),RTR(2),RPR(1),RPR(2),XKI(1),XKI(2),
     1XZI(1),XZI(2),ZX,ZIAV,VX,VIAV
      WRITE(6,116) NRUN,PERM,RPAV,FPS,FQ
      WRITE(6,118) NRUN,PERMZ,RTZP,FZPS,RFQ
      WRITE(6,117) NRUN,PERMI,FOK,FIPS,FIQ,FPSQ2
   30 CONTINUE
      IF(NPUN.EQ.0) GO TO 31
      WRITE(7,110) NSRT1,NRUN,PC1,PC2,RT1,RT2,DIFPS,QSC,VX,VIAV
      WRITE(7,111) NSRT2,NRUN,ZX, FOK,PERM,RPAV,PERMZ,PERMI
      WRITE(7,112) NSRT3,NRUN,FPS,FQ,FZPS,FIPS,FIQ
   31 CONTINUE
      GO TO 8
      END


IBFTC DECKA    DECK
      SUBROUTINE QSUBR
      COMMON RTR(2),RPR(2),XKI(2),XZI(2),P,T,ZX,VX,NQ,HVOL,PVOL,
     1ATPSI,VM,TR,TAV,QSC,NPMBP
  109 FORMAT(1H+,120X,E11.4)
  107 FORMAT(1H+,106X,4HTGB=,F7.2)
  106 FORMAT(1H+,106X,F7.2,F7.3)
```

FORTRAN SOURCE LIST
(CONTINUED)

SOURCE STATEMENT

```
      IF(NQ.GT.3) GO TO 24
      IF(VM.GT.3.) GO TO 6
      TGM=.161+1.000714*(.32044150E+02+.35902292E+02*VM
     1-.59348321E+00*VM**2+.68024521E-01*VM**3)
      GO TO 5
    6 TGM=VM
    5 RTGM=TGM+459.7
      TMR=.5*(TGM+TR)
      CMH=1.-.00041*(TMR-68.)
      HCAL=CMH*HVOL
      IF(NPMBP.EQ.2) GO TO 3
      PMBP=0.
      GO TO 4
    3 PMBP=        PVOL*(.36013032E-01+.65010191E-05*TR
     1-.97066295E-07*TR**2+.18575971E-09*TR**3)
    4 PCM=ATPSI+.01806265*HCAL+PMBP
      P=PCM
      T=TGM
      CALL ZINTPL
      CONTINUE
      CALL VINTPL
      VGM=VX
      FQMC=RTGM*ZX/PCM
      FLMC=FQMC*VGM
      WRITE(6,106) TGM,HCAL
   24 CONTINUE
      GO TO (12,11,10,22,21,21,20),NQ
   10 CONTINUE
      BINT=.14645177E+12
      ASLP=+.30670005E+10
      GO TO 13
   11 CONTINUE
      BINT=.17549885E+11
      ASLP=.11751603E+09
      GO TO 13
   12 CONTINUE
      BINT=.14083401E+10
      ASLP=.68796221E+06
      GO TO 13
   20 PWV=.12616833E+00-.50180277E-02*VM+.15902242E-03*VM**2
     1-.12360581E-05*VM**3+.96435218E-08*VM**4
      PCM=ATPSI-PWV
      TGM=VM
      RTGM=TGM+459.7
      P=PCM
      T=TGM
      CALL ZINTPL
      FQMC=RTGM*ZX/PCM
```

FORTRAN SOURCE LIST
(CONTINUED)

```
      SOURCE STATEMENT

      QI=3600.*HVOL/PVOL
      GO TO 2
   22 PCM=ATPSI
      GO TO 23
   21 PCM=ATPSI
   23 QI=HVOL/PVOL/7.8658377
      IF(NQ.EQ.6) GO TO 32
      TGB=(VM+TAV)/2.
      GO TO 33
   32 TGB=VM
   33 WRITE(6,107) TGB
      RTGM=459.7+TGB
      P=PCM
      T=TGB
      CALL ZINTPL
      FQMC=RTGM*ZX/PCM
    2 QSC=.35464100E+02*QI/FQMC
      GO TO 25
   13 CONTINUE
      FA=.40244869E-09*ASLP
      FB=.13480478E-11*VGM*BINT
      FC=-.43697106E+03/FQMC*HCAL
      QCAL=(-FB+SQRT(FB*FB-4.*FA*FC))/2./FA
      QSC=.98106241*QCAL
   25 RETURN
      END


IBFTC DECKB    DECK
      SUBROUTINE ZINTPL
      COMMON RTR(2),RPR(2),XKI(2),XZI(2),P,T,ZX,VX,NQ,HVOL,PVOL,
     1ATPSI,VM,TR,TAV,QSC,NPMBP
      DIMENSION X(4),Z(4),Y(4),XY(4)
      AP=P/14.696006
      XT=T+459.7
      APS=AP*AP
      APC=APS*AP
      Z(1)=.99999064E+00-.26875701E-03*AP+.20388746E-05*APS
     1+.50842660E-08*APC
      Z(2)=.10000004E+01-.18372581E-03*AP+.21148108E-05*APS
     1+.26213210E-08*APC
      Z(3)=.99999132E+00-.10218783E-03*AP+.18772473E-05*APS
     1+.25452826E-08*APC
      Z(4)=.10000057E+01-.40130597E-04*AP+.19694605E-05*APS
     1+.42133562E-09*APC
      X(1)=522.
      X(2)=540.
```

FORTRAN SOURCE LIST
(CONTINUED)

SOURCE STATEMENT

```
      X(3)=558.
      X(4)=576.
      ZX=0.
      YX=(XT-X(1))*(XT-X(2))*(XT-X(3))*(XT-X(4))
      DO 10 I=1,4
      WY=Z(I)*YX/(XT-X(I))
      YDEN=1.
      DO 11 J=1,4
      IF(I.EQ.J) GO TO 11
      Y(J)=X(I)-X(J)
      YDEN=YDEN*Y(J)
   11 CONTINUE
      XY(I)=WY/YDEN
   10 ZX=ZX+XY(I)
      RETURN
      END

$IBFTC DECKC    DECK
      SUBROUTINE VINTPL
      COMMON RTR(2),RPR(2),XKI(2),XZI(2),P,T,ZX,VX,NQ,HVOL,PVOL,
     1ATPSI,VM,TR,TAV,QSC,NPMBP
      DIMENSION X(4),V(4),Y(4),XY(4)
      AP=P/14.696006
      XT=T+459.7
      APS=AP*AP
      APC=APS*AP
      V(1)=.17548938E+03+.12374112E+00*AP+.13436635E-02*APS
     1-.26438540E-05*APC
      V(2)=.17768143E+03+.13823385E+00*AP+.91469145E-03*APS
     1-.12500758E-05*APC
      V(3)=.18908868E+03+.13346732E+00*AP+.53649277E-03*APS
     1-.41358431E-06*APC
      V(4)=.19965682E+03+.15672877E+00*AP+.57877927E-04*APS
     1+.56660388E-06*APC
      X(1)=527.7
      X(2)=536.7
      X(3)=581.7
      X(4)=626.7
      VX=0.
      YX=(XT-X(1))*(XT-X(2))*(XT-X(3))*(XT-X(4))
      DO 10 I=1,4
      WY=V(I)*YX/(XT-X(I))
      YDEN=1.
      DO 11 J=1,4
      IF(I.EQ.J) GO TO 11
      Y(J)=X(I)-X(J)
```

FORTRAN SOURCE LIST
(CONTINUED)

SOURCE STATEMENT

```
      YDEN=YDEN*Y(J)
   11 CONTINUE
      XY(I)=WY/YDEN
   10 VX=VX+XY(I)
      RETURN
      END
```

```
$IBFTC DECKD    DECK
      SUBROUTINE ZKINT
      COMMON RTR(2),RPR(2),XKI(2),XZI(2),P,T,ZX,VX,NQ,HVOL,PVOL,
     1ATPSI,VM,TR,TAV,QSC,NPMBP
      REAL X(4),Y(4),Z(4),V(4),XY(4),UY(4)
      DO 6 L=1,2
      AP=RPR(L)
      XT=RTR(L)
      APS=AP**2
      APC=AP**3
      AP4=AP**4
      AP5=AP**5
      X(1)=2.35
      X(2)=2.40
      X(3)=2.45
      X(4)=2.50
      XZI(L)=0.
      YX=(XT-X(1))*(XT-X(2))*(XT-X(3))*(XT-X(4))
      IF(AP.LE.0.5) GO TO 15
      Z(1)=+.91409384E-05*AP+.49995750E+00*APS+.24755887E-02*APC
     1-.63105059E-03*AP4-.19399838E-04*AP5
      Z(2)=+.84172788E-05*AP+.49996249E+00*APS+.18659479E-02*APC
     1-.60586462E-03*AP4-.14517965E-04*AP5
      Z(3)=+.71426558E-05*AP+.49997101E+00*APS+.12576095E-02*APC
     1-.56094220E-03*AP4-.13923173E-04*AP5
      Z(4)=+.61890629E-05*AP+.49997479E+00*APS+.78880104E-03*APC
     1-.54359212E-03*AP4-.89277167E-05*AP5
      GO TO 14
   15 Z(1)=-.26325036E-06*AP+.50000338E+00*APS+.23885120E-02*APC
     1-.54760410E-03*AP4-.56569552E-04*AP5
      Z(2)=+.50921005E-06*AP+.49999251E+00*APS+.18476775E-02*APC
     1-.65726604E-03*AP4-.44894074E-04*AP5
      Z(3)=+.19512728E-06*AP+.50000120E+00*APS+.12454761E-02*APC
     1-.54683247E-03*AP4-.76508518E-05*AP5
      Z(4)=-.30022462E-06*AP+.50000849E+00*APS+.71291453E-03*APC
     1-.45142925E-03*AP4-.60654859E-04*AP5
   14 CONTINUE
      DO 10 II=1,4
      WY=Z(II)*YX/(XT-X(II))
```

FORTRAN SOURCE LIST
(CONTINUED)

SOURCE STATEMENT

```
      YDEN=1.
      DO 11 JJ=1,4
      IF(II.EQ.JJ) GO TO 11
      Y(JJ)=X(II)-X(JJ)
      YDEN=YDEN*Y(JJ)
 11   CONTINUE
      XY(II)=WY/YDEN
 10   XZI(L)=XZI(L)+XY(II)
      IF(XZI(L).GT.0.) GO TO 18
      XZI(L)=ABS(XZI(L))
 18   CONTINUE
      XKI(L)=0.
      IF(AP.LE.0.5) GO TO 16
      V(1)=-.83828622E-05*AP+.51607302E+00*APS-.62369393E-02*APC
     1-.22376272E-02*AP4+.13174935E-03*AP5
      V(2)=+.77157302E-05*AP+.50792334E+00*APS-.72377735E-02*APC
     1-.15505864E-02*AP4+.66384722E-04*AP5
      V(3)=+.12400430E-04*AP+.49990709E+00*APS-.76311720E-02*APC
     1-.12045478E-02*AP4+.36724438E-04*AP5
      V(4)=+.97745033E-05*AP+.49209997E+00*APS-.76222228E-02*APC
     1-.11098311E-02*AP4+.35802582E-04*AP5
      GO TO 17
 16   V(1)=-.17734231E-06*AP+.51604741E+00*APS-.62310537E-02*APC
     1-.22105256E-02*AP4+.11455632E-03*AP5
      V(2)=-.14148708E-06*AP+.50796417E+00*APS-.73176832E-02*APC
     1-.14776284E-02*AP4+.36932510E-04*AP5
      V(3)=+.17455622E-06*AP+.49996471E+00*APS-.77300460E-02*APC
     1-.11190937E-02*AP4-.21292050E-05*AP5
      V(4)=-.15029578E-06*AP+.49214854E+00*APS-.77076887E-02*APC
     1-.10451535E-02*AP4+.18372516E-04*AP5
 17   CONTINUE
      DO 12 II=1,4
      WY=V(II)*YX/(XT-X(II))
      YDEN=1.
      DO 13 JJ=1,4
      IF(II.EQ.JJ) GO TO 13
      Y(JJ)=X(II)-X(JJ)
      YDEN=YDEN*Y(JJ)
 13   CONTINUE
      UY(II)=WY/YDEN
 12   XKI(L)=XKI(L)+UY(II)
      IF(XKI(L).GT.0.) GO TO 6
      XKI(L)=ABS(XKI(L))
  6   CONTINUE
      RETURN
      END
```